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ESSAY ON THE AMERICAN SPECIES OF ARADUS (HEMIPTERA)

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Every entomologist is in a general way familiar with the "flat-bugs" of the Hemipterous genus *Aradus*, which are often met with beneath the dead bark of trees, but no systematic treatment of the numerous New World species has ever been attempted and they have remained for the most part indeterminable by the majority of students. Bergroth, "le grand maître des Aradides," published in 1892 a list of the nineteen boreal American species then known, with four doubtful species of Walker, giving indications of their distribution, and in other papers he has made various important contributions to our knowledge, describing new forms with great clarity and elucidating the synonymy of the older species. Say, Stål, Uhler, Heidemann, Osborn, and others have given some attention to the group, mostly in the way of descriptions of supposedly new forms or notes on ethology, and Van Duzee, in his Catalogue of 1917, lists thirty-nine species in the genus, including three unrecognized species of Walker and Fyles. To Van Duzee we are further indebted for a very recent contribution (1920) in which are made known some new forms from the west. The palaearctic representatives of the genus have been very fully treated by Kiritshenko (1913) in a most excellent

paper devoted primarily to the Russian fauna, which I was unable to obtain until this essay was nearing completion; but perhaps this independence of treatment will not be without sufficient advantages to outweigh whatever lack of coördination may be noted. I am very greatly indebted to Professor A. Petrunkevitch, of Yale University, for providing me with a scholarly translation of certain portions of Kiritschenko's work, which, except for Latin diagnoses, is in the Russian language.

Fabricius, in 1803, established the genus *Aradus*,¹ as follows:

"*Os* rostro inflexo, sub capitis apice inserto. *Labium* breve membranaceum, setaceum. *Antennae* cylindricae, quadriarticulatae.

"*Aradi* corpus medium oblongum, depressum, planum, immarginatum, tardum, *capite* exserto ovato, antice compresso, subemarginato, margineque postico prominente, acuto, *oculis* globosis, prominulis, lateralibus, *antennis* brevibus articulis distinctioribus, ante oculos insertis, *thorace* plano, transverso, acuto, *elytris* coriaceis, apice membranaceis haud inflexis vix longitudine abdominis, *pedibus* brevibus femoribus longiusculis, clavatis."

The palaearctic *betulae* Linnaeus was indirectly indicated as the type species by a special statement of characters, chiefly generic. Later the genus was restricted to its present limits by the elimination of various discordant elements, such as *Aneurus* Curtis (1827), *Mezira* Amyot and Serville (1843), etc., and it has been held to constitute a distinct subfamily by all authors since 1843, until Reuter (1912), in his comprehensive treatment of the Heteropterous families, advocated its elevation to family rank. This most recent view has not met with universal acceptance, but my own inclination has been to accept Reuter's subdivision of the old families Coreidae, Aradidae, and Tingidae, on the ground that conclusions arrived at in a comprehensive and well-reasoned investigation should not be set aside or ignored without correspondingly complete refutation, based on new evidence or better logic. In the case of the Aradidae such new evidence is afforded by recent discoveries in the anatomy of the trophi. Spooner (1920) has shown that in *Neuroctenus* (of the Mezirinae) the greatly enlarged tylus serves as a sheath for

¹ *Aradus*, an ancient city of Syria (A' radus).

the long mandibular and maxillary setae, which, coiled in a vertical, double spiral, occupy the space thus provided. The same remarkable structure in *Aradus quadrilineatus*, *A. robustus*, and *A. similis* (Aradinae) was discovered independently by Miss Caroline A. Hosford, during a morphological investigation carried on in this laboratory. The occurrence of such an important and peculiar type of structure in both groups is, in my opinion, convincing evidence that the Aradinae and Mezirinae are homophyletic, properly subordinate branches of a single well-defined family; and thus their other common characteristics cannot be viewed as merely adaptive features, due to convergent evolution in the same environment, as Reuter maintains, but must be held to signify close relationship.

HABITS

The ethology of these insects, while very imperfectly known, has certain interesting aspects which would seem well worthy of closer investigation. Observations which have been made on two or three species indicate that they feed on the juices of fungi, and it is likely that this will prove to be the general rule (with some exceptions, vide *cinnamomeus*, p. 95), but present knowledge is insufficient to show whether or not the various species are restricted to definite species of fungi, or to the fungi affecting particular trees, as is suggested by such facts as the constant occurrence of *similis*, for instance, about *Polyporus betulinus*, the shelf-fungus of birch.

There are some indications of nascent social instincts to be observed in the behavior of many of the species, for very commonly little colonies made up at most seasons of adults and young in various stages of development may be found clustered in small areas, even where a considerable expanse of apparently uniform conditions is afforded by large sheets of bark.

In their flattened form and in the peculiar mode of articulation of their appendages, the Aradids display structural features most admirably suited to their peculiar abode, which bring to mind very forcibly the vexed questions of adaptation. Ages ago, some more or less flattened ancestor, under the influence, perhaps, of a newly-acquired negative phototropism, discovered

a novel and uncrowded habitat under the bark on which he had previously lived, protected in some degree from hostile observation by concealing coloration, and in this seemingly ill-favored environment, become most suitable in the lapse of time, the race has prospered, developing numerous species and achieving a world-wide distribution. More intimate adaptation could hardly be imagined than that which these insects now exhibit, and it seems indeed difficult to reconcile with such conditions a theory of evolution which dogmatically bids us eliminate from consideration any formative or modifying influence of the immediate surroundings; on the contrary the impress of the environment is manifest in every feature of the group. There are some, however, who find it easier to believe in chance adaptation of the animal before it has found its fitting place in the scheme of things, and very likely both processes have had a share in producing every case of observed adaptation, since there is nothing essentially antagonistic in the two views. The old memories still live in the race, notwithstanding the changes which have been affected in the course of time, for in the first warmth of spring obscurity loses its charm for a brief season and the insects emerge and appear on the surface of the bark, where the ancestral coloration still serves to make them invisible, and they fly actively in the sunshine, seeking new and distant homes in obedience to the universal instinct of migration.

PTERYGO-POLYMORPHISM

This power of flight is not shared, however, by all individuals, for, as in many other Hemipterous families, certain species are pterygo-polymorphic, presenting more or less commonly brachypterous individuals which lack functional hind wings and exhibit reduction in the hemielytra, with concomitant modification of the prothorax, within which certain muscles of flight are atrophied. In *Aradus* this reduction is variously related to sex and is manifested in two ways: by abbreviation of the hemielytra, or true brachyptery, and by extreme attenuation without loss in length, which may be termed stenoptery. In both cases the hind wings are vestigial or absent. Occasionally we meet with individual cases of partial brachyptery, with hind wings present,

in species which are normally fully winged (such as *aequalis* and *quadrilineatus*), and very often there is considerable individual variation in hemielytral length. We may suppose that the true polymorphic species have become established as such when unusually pronounced modifications of this kind appeared as mutations, that is, in connection with corresponding germinal changes. None of the species are known to produce normally forms having various distinct degrees of brachyptery, such as occur in the Nabidae and Gerridae. From the following table, which shows the known morphological features of pterygo-polymorphism in the American species, we may note that stenoptery is found only in male individuals, while brachyptery is, with one exception, confined to females, suggesting that the phenomenon is connected with hereditary processes of a Mendelian nature, which invite experimentation. At present the ethological significance of this polymorphism seems quite beyond conjecture, although Reuter (1875) and Kirkaldy (1899) have thought to trace here the workings of natural selection.

Table of Pterygo-polymorphic Species

Species	Macrop- terous	Stenop- terous	Brachypterous	
			Membrane vestigial	Membrane absent
<i>inlectus</i>	—	—	♀	—
<i>curticollis</i>	♂	—	♀	—
<i>proboscideus</i>	♂ ♀	—	♀	—
<i>orbiculus</i>	—	♂	♀	—
<i>cinnamomeus</i>	♀	♂	♀	♀
<i>niger</i>	♂ ♀	—	—	♂ ♀
<i>hulemanni</i>	♂ ♀	♂	—	♀

SPECIES FORMATION AND VARIATION

The species of *Aradus* are, with very few exceptions, distinctly differentiated, although the group as a whole is remarkably homogeneous. This condition, with its wide distribution over the earth, would seem to mark the genus as of great geological antiquity, among insects, and as one which has reached a state of relative stability, though still far from the stage when signs of approaching extinction begin to appear. It is evidently enjoying the optimum period of its evolutionary career, after the more profitable adjustments have been accomplished and before

extreme specialization has supervened with its ultimately fatal consequences. Examining in detail the criteria which mark the various forms, we find that they are relatively few in number and are such as to indicate that the species have undoubtedly arisen by a "shuffling of characters." I think, however, that this shuffling must have largely ceased, once the viable combinations were hit upon, and that long since, because we have to do here with true species, each with a characteristic habitus resulting from the combined influence of a multiplicity of minute peculiarities in every part of the body, and thus distinguished not alone by the few criteria which we find expressible in words. *Aradus* provides us with exceptionally favorable material for the study of the species as a taxonomic unit, because, with this clear specific development, there is frequently a high degree of individual variation. In addition to a certain instability in color and size, which is usual among the Hemiptera, there is great diversity among individuals in the details of form and even in the proportions of parts, especially noticeable in some of the species of wide range like *proboscideus* and *similis*, but usually these variations may be recognized as individual peculiarities by their frequent asymmetry, by intergradation, or by an entire lack of correlation with other characters, and there are few which are considerable enough to cause doubt in determination or which are of such nature as, in my opinion, to require naming. Furthermore, the permutational type of evolutionary history referred to above would tend to produce forms having the relatively slight differences in degree of specialization which we meet with in this genus—a condition which strikes us at once in the attempt to arrange the species in an approximately natural linear sequence or even in groups.

ARRANGEMENT OF THE SPECIES IN GROUPS

There are, however, various degrees of relationship among the species, which may be indicated by the establishment of groups, but it must be borne in mind that these groups are by no means sharply distinguished, and both the groups and the species of which they are composed exhibit complicated interrelationships which are quite beyond expression in a linear arrangement.

Thus species which are closely similar, for instance in antennal structure, may differ widely in genital characters, and in general we note a low degree of correlation if we examine the various species with respect to any two or more of the important specific criteria. These conditions are a source of satisfaction in one respect at least; they would seem to preclude any attempt to establish "new" genera at the expense of *Aradus*. I am quite aware that the grouping adopted is unsatisfactory in many particulars; its correlation with Kiritshenko's arrangement of the palaearctic species leaves much to be desired; but a fully acceptable system of groups cannot be established without a comprehensive study of materials representing the species of the world, a study which no one is ready to undertake at present. The American species, fully listed further on, may be grouped according to the subjoined scheme.

Aequalis Group.—Antennae slender, the second and third segments equal in length and cylindrical; pronotal and abdominal margins entire; granulation of body fine. This group, like the four immediately following, contains a single species not closely related to others and causing disturbance if placed elsewhere than at the beginning.

Crenatus Group.—Pronotal margins serrate; abdominal margins strongly crenate; granulation very coarse; antennal characters much as in the preceding.

Quadrilineatus Group.—Third antennal segment strongly enlarged; pronotal structure agreeing in general with the preceding; genital characters distinctive.

Amplius Group.—Antennae cylindrical, the third segment long, yellow in apical half; pronotum as in the two preceding; female genitalia peculiar.

Montanus Group.—Antennae moderately stout, about equal in thickness to front femora, the second segment proportionately short, leading toward the next group

Ornatus Group.—Antennae very stout, clavate, generally roughened; form of body broad; corium strongly dilated at base; coloration often variegated. *Ornatus* is isolated by pronotal and genital structure. The four species following it have oblique, serrate

pronotal sides and rather short genital lobes in the female. *Robustus* has a characteristic pronotal shape, very thick antennae, and long, widely distant female genital lobes. *Intectus* leads to *duzei*, etc., with entire pronotal margins. The species to *implanus* have a long first genital segment in the female; then follows a series with the first genital short and with the antennae thinner, leading toward the next group.

Proboscideus Group.—Antennae slender and cylindrical, the second segment much longer than the third; form of body rather elongate; corium strongly dilated at base. There are two types of pronotal structure: the species to *consors* have the dorsal surface relatively flat; in the rest the anterior region is strongly elevated, the transverse impression deep. The extreme development in length and slenderness of antennae is reached in *debilis*, while *cincticornis* and *parvicornis* manifest a tendency to reduction.

Similis Group.—Antennae slenderly clavate, the second segment enlarging usually from near base and variable in length, but always much longer than the third; general form distinctly elongate, the abdomen often narrowed posteriorly in the female; corium strongly dilated at base. *Opertaneus* is intermediate in some respects between this and the preceding group, especially in antennal structure. In the last four species the first genital segment of the female is very short, recalling the condition in *debilis* and allies.

Compressus Group.—Pronotum flattened, the lateral margins entire; second antennal segment clavate; corium moderately dilated at base; form rather broad.

Tuberculifer Group.—This group is more than usually ill-defined, and consists of three species intermediate with respect to the degree of expansion of the corium between the preceding and following sections. The pronotum is rather flat, with entire margins, and the antennae are slenderly clavate, almost linear in *funestus*.

Lugubris Group.—Pronotal margins generally sinuate anteriorly and entire or granulate; form narrow; second antennal segment narrowed toward base or almost linear; head provided with oblique pale lines at base; the postocular tubercles slight or

absent; color generally black. In this group the basal expansion of the corium is reduced, so that in a majority of the American species the lateral margin of the corium is straight.

Cinnamomeus Group.—Antennae short and thick, almost moniliform; pronotal carinae vestigial; color reddish brown. A single isolated species of wide distribution, which has some affinity, perhaps, with the subgenus *Quilnus*, especially in type of pterygopolymorphism.

Orbiculus Group.—Second antennal segment very slightly clavate and as long as head; extreme sexual dimorphism. A single species with small stenopterous male and large brachypterous female, somewhat related to *Quilnus* in wing characters and pronotal form.

Insolitus Group.—Margins of pronotum strongly angulate; rostrum extending but little beyond base of head. The remarkable species constituting this group has little relationship with others, but forms a connecting link between the subgenera by reason of its very short rostrum.

Subgenus *Quilnus*.—The three American species form a single well-defined group characterized by the short rostrum, not reaching the base of the head; pronotum small, without expanded margins; and a strong tendency to wing reduction. Kiritshenko's statement "*marginibus lateralibus pronoti totis rectis*" will not always apply, since in macropterous forms the sides may be distinctly sinuate (vide fig. 60).

DISTRIBUTION

Species of the genus *Aradus* have been found in all the great faunal divisions of the world, but a vast majority inhabit the northern hemisphere, few occurring in the tropics. That this is a true expression of the facts, and not one founded merely on inadequate collecting, becomes clearly evident if we consider the records of Aradidae given by Champion in the *Biologia Centrali-Americana* (1897 to 1901). The Aradinae and Mezirinae (Brachyrhynchinae) are found in similar situations and collected by the same methods, but of *Aradus*, representing the former, only one species, *falleni*, is recorded, while of the various Mezirine genera seventy-six species are listed. In the material which

has been available during the present study, I have come across four species from the regions south of the United States. Stål² records *gracilicornis* from Cuba, and Lethierry and Severin³ indicate for *angustellus* a wide dispersal over the South American continent. Bergroth (1895) reports *crenatus* from Mexico, and Uhler (1878) mentions a specimen of *quadrilineatus* which he has from Panama. Champion⁴ remarks that there may be some mistake regarding the two records last noted, but the latter, at least, may be accepted. I have examined the specimen, still preserved in the United States National Museum, which is a perfectly typical *quadrilineatus* (male) and bears the written label, "Pan." In the Cornell collection there are examples of *niger* bearing the label "Mex." It is reasonably certain, however, that further collecting on the central plateau of Mexico will result in the addition of a few more species to the fauna of Central America, since the genus is fairly well represented in the states which include the northern extension of this faunal area. In contrast to this paucity of representation in the Neotropical realm, we find about one hundred and thirty-five species occurring in the northern hemisphere, divided with approximate equality between the Nearctic and Palaearctic regions. With the exception of a few to be noticed presently, the Old World forms are specifically distinct from those of the New, but many of them are closely related and there is every evidence of former intercommunication. Of the three Holarctic species, *crenatus*, *lugubris*, and *cinnamomeus*, the first is confined on this continent to the eastern region (and Mexico ?); the third in its typical form occurs east of the Rocky Mountains and south of Canada, but has produced a western race which ranges as far north as British Columbia; while *lugubris* is met with over the entire continent from the Mexican boundary to Labrador and Alaska. The distribution of this species affords some evidence for the theory of preglacial migration by the northwest route, and might perhaps be cited as lending some support to Scharff's⁵ criticism of the commonly accepted views on the rigors of the Pleistocene climate in the

² Enum. Hem.

³ Cat. Gén. Hém.

⁴ Biol. Cent.-Amer., p. 65, footnote.

⁵ 1912, pp. 76, *et seq*

north. If we deny that such a species could have maintained its existence here through the period of glaciation, we must imagine it repeatedly driven southward and later returning unchanged by its travels, which, being in a north and south direction, would certainly prove far more eventful than the preceding journey from west to east. On the other hand, it could be argued that the uniform character of the immediate environment, under the dead bark of trees in certain pretty definite stages of decay, might well protect the species from any evolutionary influences which its wanderings might otherwise exert; but we must not overlook in this connection that the genus, compact as it is, contains more than a hundred distinct species, almost all of them produced under these apparently uniform conditions, and hence, while we must suppose that these numerous forms have become differentiated through mutation, it is difficult to believe that the retreat and return could have been accomplished even once without setting in motion the forces underlying germinal change, which quite evidently have been particularly active in this genus.

A few other species deserve especial mention in connection with the subject of geographical distribution. *Aradus falleni* is one of the few animals which are truly Neogaëic; it occurs widely over South America, in Central America, and in North America as far northward as Connecticut and Vancouver Island. Notwithstanding the vast extent of this range there is little variation among individuals and never the slightest doubt in determination. By way of contrast in the matter of variation, we find that *proboscideus*, while fairly constant in specific characters, exhibits a considerable diversity in color and in structural details, more in keeping with its wide distribution—California, the Rocky Mountain region, and east across Canada to New England. *Abbas*, although it occurs throughout the Nearctic region, presents no variation worth mentioning, even in the narrow white annulation of the antennae, but in *lugubris* a similar ornamentation may be developed in varying degrees, quite independently of locality. It may be noted in passing that we have here an excellent illustration of the principle that characters phenotypically identical may depend upon quite diverse internal factors. The annulation of the antennae in *abbas* is evidently the expression of some constant element in the hereditary constitution of the species, while in *lugubris* these markings are subject to individual somatic variation, with the possibility that Mendelian processes are also involved.

The subject of faunal zones is reserved for detailed treatment elsewhere, but the number of species occurring in the various sections of our territory may be indicated roughly as follows:

<i>Northeast</i> (Eastern Canada, New England, New York, Pennsylvania)	27
<i>Southeast</i> (North Carolina, Alabama, Florida)	15
<i>Mississippi Basin</i> (excluding Texas)	21
<i>Northwest</i> (Alaska, Western Canada, Washington, Oregon)	22
<i>Southwest</i> (including Colorado, Texas, excluding California)	22
<i>California</i>	23
<i>Central and South America</i>	4

The following table presents the arrangement of species adopted, together with a brief statement of principal data, not repeated, for the most part, on later pages. Parentheses indicate records taken from the literature. This tabulation should be useful in directing the attention of students to deficiencies in our knowledge, and is intended to serve as a convenient form for recording new observations. Absence of remark in the last column means that only the macropterous form is known.

SYSTEMATIC LIST OF SPECIES WITH SUMMARIZED DATA

List	Page	Distribution	Host Plants	Poly- morphism
Subgenus ARADUS				
Fabr.				
Aequalis Group				
1. <i>A. aequalis</i> Say	29	Eastern (and southern) North America		Incipient
Crenatus Group				
2. <i>A. crenatus</i> Say	30	Eastern North America (Mexico, Bergr.); Palacuretic.	<i>Platanus</i> , (<i>Pyrus</i> , <i>Quercus</i> , <i>Fagus</i> , <i>Betula</i> , <i>Abies</i> , <i>Kirit.</i>); (maple, hickory, <i>Liriodendron</i> , Heid.).	

List	Page	Distribution	Host Plants	Poly- morphism
Quadrilineatus Group				
3. <i>A. quadrilineatus</i> Say	32	Eastern North America and west across Canada; Panama.	<i>Quercus</i>	Incipient
Ampliatus Group				
4. <i>A. ampliatus</i> Uhl.	33	California		
Montanus Group				
5. <i>A. montanus</i> Bergr.	34	Colorado, 10,000 feet; Quebec.		
Ornatus Group				
6. <i>A. ornatus</i> Say	35	Pennsylvania, District of Columbia, Maryland, Ohio, Indiana.		
7. <i>A. coarctatus</i> Heid.	36	California		
8. <i>A. fuscomaculatus</i> Stål	37	Pacific Coast	<i>Picea sitchensis</i> , live oak.	
9. <i>A. pannosus</i> Van D. var. <i>incomptus</i> var. nov.	38	California.		
10. <i>A. behrensi</i> Bergr.	39	Pacific Coast		Incipient
11. <i>A. robustus</i> Uhl. var. <i>insignis</i> var. nov.	41	North America, east of Rocky Mountains.	<i>Quercus</i>	
12. <i>A. intectus</i> sp. nov.	42	Wyoming. Colorado.		Exhibited
13. <i>A. duzei</i> Bergr.	43	Northeastern North America	<i>Pinus</i>	
14. <i>A. implanus</i> sp. nov.	45	Northeastern North America		
15. <i>A. apicalis</i> Van D.	46	California		

List	Page	Distribution	Host Plants	Poly- morphism
16. <i>A. curticolis</i> Bergr.	47	North Carolina, Georgia.		
17. <i>A. depictus</i> Van D.	47	Pacific Coast	Live oak	
18. <i>A. concinnus</i> Bergr.	49	Southern Cali- fornia	<i>Platanus</i>	
Proboscideus Group				
19. <i>A. proboscideus</i> Walk.	51	Western states, Alaska, Can- ada, Northern states, New England.	Spruce; fungus. <i>Pinus</i>	Rare
20. <i>A. basulus</i> sp. nov.	54	Mountains of Maine and New Hampshire		
21. <i>A. furvus</i> sp. nov.	55	Arizona		
22. <i>A. consors</i> sp. nov.	56	Massachusetts		
23. <i>A. persimilis</i> Van D.	56	Rocky Mountains	Douglas spruce	
24. <i>A. melioxinus</i> sp. nov.	58	Pacific Coast		
25. <i>A. vadosus</i> Van D.	58	British Columbia, Montana		
26. <i>A. debilis</i> Uhl.	59	Western states, ? Massachusetts	(About <i>Cryptoporus</i> on <i>Pinus</i> , Hub- bard)	
27. <i>A. cincticornis</i> Bergr.	61	Alabama		
28. <i>A. parvicornis</i> sp. nov.	62	Oregon, New Mexico		
Stimilis Group				
29. <i>A. opertaneus</i> sp. nov.	63	Minnesota		
30. <i>A. similis</i> Say var. <i>centriguttatus</i> Bergr.	64	United States, east of Rocky Mountains	<i>Betula</i> , <i>Polyporus</i> (elm, maple, Heid.)	

List	Page	Distribution	Host Plants	Poly- morphism
31. <i>A. shermani</i> Heid.	66	Quebec, Ontario, North Carolina		
32. <i>A. acutus</i> Say	67	United States	<i>Quercus</i>	
33. <i>A. inornatus</i> Uhl.	69	North America, east of Miss- issippi River		
34. <i>A. blaisdelli</i> Van D.	70	West of Rocky Mountains		
35. <i>A. hesperius</i> sp. nov.	71	Colorado, Ari- zona		
36. <i>A. approximatus</i> sp. nov.	72	Maine, New Jer- sey, Mississippi	<i>Pinus</i>	

Compressus Group

37. <i>A. compressus</i> Heid.	73	Northwestern North America		
38. <i>A. borealis</i> Heid.	74	Northeastern North America		
39. <i>A. insignitus</i> sp. nov.	75	Massachusetts		
40. <i>A. uniformis</i> Heid.	76	Eastern United States	<i>Pinus</i>	

Tuberculifer Group

41. <i>A. tuberculifer</i> Kby.	77	Across northern North America, southward through Rocky Mts.		
42. <i>A. parshleyi</i> Van D.	78	British Columbia		
43. <i>A. funestus</i> Bergr.	79	With <i>tuberculifer</i>		

Lugubris Group

44. <i>A. lugubris</i> Fall. var. <i>nigricornis</i> Reut.	80	Holarctic	(<i>Juniperus</i> , <i>Picea</i> , <i>Pinus</i> , Kirit.)	
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List	Page	Distribution	Host Plants	Poly- morphism
45. <i>A. arizonicus</i> sp. nov.	83	Arizona		
46. <i>A. angustellus</i> Blanch.	83	Chili (Colombia, Argentina, Pat- agonia, L. & S)		
47. <i>A. abbas</i> Bergr.	84	Nearctic	(<i>Taxodium</i> , <i>Pinus</i> , Heid.)	
48. <i>A. breviatus</i> Bergr.	86	Florida		
49. <i>A. gracilicornis</i> Stål.	87	Southern states, West Indies	<i>Taxodium dis-</i> <i>tichum</i>	
50. <i>A. marginatus</i> Uhl.	88	Utah		
51. <i>A. uniannulatus</i> sp. nov.	90	New York, Dis- trict of Colum- bia, Michigan, Alberta.		
52. <i>A. evermanni</i> Van D.	91	Southwestern states		
53. <i>A. falleni</i> Stål.	92	Neogacic	(<i>Pinus</i> , Van D.)	
54. <i>A. snowi</i> V. D.	94	Arizona, New Mexico		
Cinnamomeus Group				
55. <i>A. cinnamomeus</i> Panz.	95	United States, east of Rocky Mts., Califor- nia; Palaeartic	<i>Pinus</i> (<i>Alnus</i> , <i>Picea</i> , <i>Betula</i> , <i>Juniperus</i> , Kirit.)	Exhibited
subsp. <i>antennalis</i> subsp. nov.		Western states		Exhibited
Orbiculus Group				
56. <i>A. orbiculus</i> Van D.	97	Western states	Lodgepole pine	Exhibited
Insolitus Group				
57. <i>A. insolitus</i> Van D.	98	Pacific Coast		

Subgenus *QUILNUS*

Stål.

- | | | | | |
|------------------------------------|-----|---|--|-----------|
| 58. <i>A. niger</i> Stål. | 100 | Eastern states,
Colorado Mex-
ico | <i>Pinus palustris</i> ,
and other
species | Exhibited |
| 59. <i>A. nigrinus</i>
sp. nov. | 101 | Arizona | | |
| 60. <i>A. heidemanni</i>
Bergr. | 102 | British Columbia
and Rocky Mt.
region | | Exhibited |

NEW SYNONYMY

With the invaluable assistance of Mr. K. G. Blair, of the British Museum, and of Mr. G. A. Moore, of Quebec, as detailed farther on, it has been possible to fix the status of the species hitherto unknown to students of the group, with resulting synonymy as noted below. In studying Uhler's collection I have taken occasion to select type specimens from the original series of species described by him, and have been able to avoid the necessity for any change of names, since his species have been well understood by subsequent authors. The uncertain names listed in Van Duzee's Catalogue on page 135 are disposed of as follows:

A. proboscideus Walker = *A. hubbardi* Heidemann = *A. taylori* Van Duzee (1920).

A. fascicornis Walker = *A. similis* Say.

A. luteolus Fyles = *A. proboscideus* Walker.

The group (or subgenus) *Piestosoma* Lap. is not represented in our fauna.

Little space is devoted in subsequent pages to bibliography and established synonymy, since I can perceive no useful purpose in transcribing this matter from Van Duzee's 1917 Catalogue.

MATERIAL

The material on which this study is based consists of more than twenty-seven hundred specimens of the American species of *Aradus*: a very large number considering the rarity of most of the forms and the difficulties in the way of collecting them. I have had for examination also a considerable number of exotic

species. I append a list of the institutions and individuals whose valued assistance has made it possible to assemble this adequate representation of the group. In returning the material to the various owners, I have provided most of the specimens with a dated label, so that it will always be possible for future students to recognize those which were studied in connection with this investigation.

Academy of Natural Sciences of Philadelphia (H. Skinner).

American Museum of Natural History (F. E. Lutz).

Boston Society of Natural History (C. W. Johnson).

Brooklyn Institute of Arts and Sciences (C. Schaeffer).

Cornell University, including the Heidemann Collection (J. C. Bradley).

Illinois State Laboratory of Natural History (C. P. Alexander).

University of Kansas (C. P. Alexander and H. B. Hungerford).

Louisiana Experiment Station (T. H. Jones).

Massachusetts Agricultural College (H. T. Fernald).

University of Michigan (F. M. Gaige).

University of Minnesota (H. H. Knight).

Museum of Comparative Zoology (N. Banks).

National Collection, Ottawa (C. G. Hewitt, A. Gibson, J. McDonnough).

North Carolina Agricultural Experiment Station (R. W. Leiby).

Ohio State University (H. Osborn).

South Dakota State College (H. C. Severin).

United States National Museum (E. H. Gibson).

Barber, H. G.

McAtee, W. L.

Bergroth, E.

Moore, G. A.

Davis, Wm. T.

Olsen, C. E.

Downes, W.

Osborn, H.

Drake, C. J.

Ruhmann, M. H.

Dury, C.

Slosson, Mrs. A. T.

Frost, C. A.

Torre-Bucno, J. R. de la

Gerhard, W. J.

Van Duzee, E. P.

Hussey, R. F.

Wirtner, M.

Marchand, W.

In closing this introduction I would express my thanks to the many who have assisted in one way or another; on all sides I have found a most hearty spirit of coöperation. It is my pleasant duty to mention especially my indebtedness to Dr. E. Bergroth, of Finland, who has sent to me type specimens of his species, in some cases uniques, and who has given me valuable advice; to Mr. E. P. Van Duzee, of California, who bravely entrusted to the post a large number of indispensable types; to Mr. G. C. Champion and Mr. K. G. Blair for assistance in connection with the Walkerian species; to Mr. G. A. Moore for an extremely careful examination and report on the type of *luteolus* Fyles.

This paper is dedicated to my wife, who has been of great help in many ways, especially in translating works written in the Swedish language.

SYSTEMATIC TREATMENT

In the following pages will be found full descriptions of the American species of *Aradus*, with detailed distributional records, and figures illustrating important structural features so clearly that certain points, such, for instance, as the shape of the antennal segments, structure of the female genital plates, and form of the pronotum have been entirely eliminated from the descriptive paragraphs. The characters of specific importance, which for the most part were first brought forward as such in the writings of Reuter and Bergroth, will be readily appreciated by students having a general knowledge of entomological terminology; but special mention may be given a few which are less commonly met with outside the group under consideration. The head is peculiar in having a greatly enlarged tylus, sometimes called the median lobe or anterior prolongation; the width of the head is always considered to include the eyes; on the vertex, between the eyes, are two depressions, often connected posteriorly, referred to as impressions of vertex; lateral to the anterior ends of these impressions and obliquely anterior to the eyes are the preocular tubercles, which have sometimes been called ante-, inter-, or intraocular; behind the eyes are the postocular tubercles, called by some authors temporal teeth or tubercles. The disc of the pronotum bears six longitudinal ridges, the carinae; of these the median pair are closely approximated, the

intermediate pair are separated by the preceding, and the lateral pair, always much abbreviated, occupy the postero-lateral angles of the pronotum. In the figures these carinae are represented diagrammatically. The connexivum is the marginal region of the abdomen. The distinct abdominal segments number six, to which is added in the male one genital segment, convex below and hollowed for the reception of the genitalia above, and continued in two genital lobes. This is represented in the figures as seen from below, usually the apex only (except fig. 25b), but in cases of unusual modification (cf. fig. 47b), with the preceding segments. In the female there are two genital segments in addition to the six abdominal, of which the first genital bears the female genital lobes and the second is very small (figs. 1a, 1g, 2g, gl.). In observing the important specific characters furnished by the female genital structure, the following points, not referred to in the descriptions, should receive special attention (fig. 1): length of V on median line as compared with length of its lateral margin; shape of its apical margin at middle (ap. m.); position of the imaginary line (xy) connecting the apical angles of VI with reference to the genital segments; length of VI as compared with that of V on median line; shape of apical margin of VI at middle (cf. figs. 1a, 3a and 47a); shape of the lateral portion of VI; relative lengths of VI, 1g and 2g; shape of the genital lobes. Very often important characters are afforded by the shape of the dorsal genital segment (fig. 12c, d. g. s.) and of the projecting genital lobes. Strongly costate longitudinal veins divide the corium of the hemicytra into three areas (fig. 12d), the exocorium (ex), mesocorium (m), and endocorium (en), which may be strongly chitinized or hyaline, provided with numerous transverse veinlets or without them.

It will be noted that in the descriptions a good deal of emphasis is placed on the proportions of parts, often indicated by figures in parentheses. The student will find it impossible to estimate these proportions with sufficient accuracy and hence must make use of an eyepiece micrometer placed in one of the eyepieces of the binocular microscope. The examination of ventral structures is greatly facilitated by the use of "art-gum" or some such soft substance, into which the head of the pin may

be inserted; the figures are placed on the plates in positions corresponding to those in which the specimens are most conveniently set for examination with the usual lighting arrangements. Finally, I would refer again to the variability in detail which these insects exhibit; in comparing specimens with the figures slight discrepancies will often be noted, but experience will soon obviate any difficulties which may be encountered on this score.

Family ARADIDAE

(Superfamily *Aradoidea* Reuter)

Insects of flattened form, living under the dead bark of trees. Head horizontal; the tylus greatly enlarged to accommodate the coiled trophic setae; antenniferous tubercles usually provided with an acute lateral process; bucculae forming a rostral groove, which is often continued on the sterna; rostrum four-segmented, the first segment very short; ocelli absent; antennae four-segmented, usually longer than the head. Hemelytra composed of corium, clavus, and membrane; clavus narrowed toward apex, seldom extending beyond apex of scutellum; veins of membrane few, irregular, variable within the species, sometimes lacking. Pleural sutures of thorax vestigial. Hind coxae rotatory. Tarsi two-segmented, always without arolia.

Type genus.—*Aradus* Fabricius.

Table of Subfamilies

Head narrowed behind the eyes, eyes projecting strongly; trochanters connate with femora; abdominal spiracles placed near basal margin of each segment (fig. 1a).....	Aradinae
Head wider just behind eyes than immediately in front of them, eyes not projecting; trochanters free; spiracles midway between basal and apical margins of segments..	Mezirinae

Subfamily ARADINAE

(Family *Aradidae* Reuter)

Insects of small to moderate size, with roughly tuberculate surface; head narrowed behind eyes; antenniferous tubercles prolonged in a prominent spine, which is often toothed externally;

eyes strongly projecting, sometimes almost pedunculate; ocelli absent; first antennal segment short and thick, suddenly constricted at base to form a short oblique stem; bucculae very short, situated anteriorly; rostrum usually extending beyond base of head; rarely (subgenus *Quilnus*) shorter. Legs of moderate length, homonomous; the trochanters small and scarcely separated from the femora; tarsi two-segmented. Hemelytra composed of corium, clavus, and membrane, the last well differentiated and distinctly veined; pterygo-polymorphism frequent. Ventral transverse sutures of abdomen mostly angulate; spiracles distant from lateral margins, near basal.

Type and only genus.—*Aradus* Fabricius.

Genus **ARADUS** Fabricius

1803. *Aradus* Fabricius, Syst. Rhyng. p. 116.

Flattened ovate or elongate-ovate species with surface more or less roughly granulate. Tylus forming an entire, obtuse, subcylindrical or laterally flattened lobe; a small spine or tubercle placed anteriorly and obliquely inward near the eyes, more or less strongly developed, and usually one behind the eyes; vertex with a variously developed, usually U-shaped impression. Pronotum transverse, with six longitudinal carinae, the lateral pair much abbreviated. Scutellum large, roughly triangular or pentagonal, the margins and base usually elevated. Hemelytra usually shorter and narrower than abdomen, sometimes strongly abbreviated or narrowed, the membrane usually with four longitudinal veins and a varying number of irregularly anastomosing cross-veins. Connexivum widely dilated. Male genital segment large, convex and partially divided ventrally, bearing nearly horizontal genital lobes posteriorly; female with two visible genital segments, completely divided in the median line and, with the similarly divided median portion of the sixth ventral segment, forming movable valves; the first bearing postero-lateral genital lobes partly visible from above, the second much smaller, terminal, and generally not visible from above.

Type species.—*Cimex betulae* Linnaeus.

Table of Subgenera and Species

1. Rostrum extending beyond base of head; lateral margins of pronotum more or less explanate (Subgenus **Aradus** Fabricius, p. 29)..... 2
 Rostrum not reaching base of head; pronotum more or less distinctly trapezoidal, the lateral margins not explanate (Subgenus **Quilnus** Stål, p. 99).....58
2. Median carinae of pronotum slightly developed, obsolete anteriorly; antennae scarcely longer than head, very robust, the third segment not twice as long as the first.....55. **cinnamomeus** Panzer
 - (a) Third antennal segment unicolorous; hemielytra in brachypterous female with membrane absent or vestigial.
 subspecies **cinnamomeus** typical
 - (b) Third antennal segment yellow in apical half; brachypterous female with distinct narrow membrane.
 subspecies **antennalis** subsp. nov.
 Median carinae of pronotum distinct, extending to anterior margin; antennae otherwise 3
3. Rostrum short, not extending beyond apical one-fifth of prosternum; sides of pronotum strongly angulate, concavely arcuate anteriorly (fig. 57d).....57. **insoletus** Van Duzee
 Rostrum longer, extending at least to front coxae; pronotum otherwise 4
4. Second antennal segment about as long as third, both slender and cylindrical; length more than 8 mm..... 5
 Second segment generally distinctly longer than third, one or both often not cylindrical..... 6
5. Lateral margins of abdomen almost entire; pronotum widest slightly behind middle.....1. **aequalis** Say
 Lateral margins strongly crenate; pronotum widest well before middle.
 2. **crenatus** Say
6. Third antennal segment three-fourths as long as second, yellow in apical half, both cylindrical; second one-half thicker than third; size large, length 11 mm.....4. **amplius** Uhler
 Antennae otherwise; size usually smaller..... 7
7. Third antennal segment enlarged, about one-half thicker than second (fig. 3c); length 7.5-9 mm.....3. **quadrilineatus** Say
 Third antennal segment slightly if at all thicker than second..... 8
8. Antennae very robust, at the widest point most distinctly thicker than front femora..... 9
 Antennae more slender, often cylindrical, not or but slightly thicker than front femora.....19
9. Pronotum with three polished black areas behind middle; head and pronotum dark, contrasting with pale hemielytra and abdomen.
 6. **ornatus** Say
 Pronotum without such areas; coloration generally otherwise.....10

10. Third antennal segment largely yellow; body black; pronotum two-thirds as long as head; abdomen almost circular.

16. **curticollis** Bergroth

Third antennal segment concolorous, or pale toward apex only; body brownish; pronotum longer 11

11. Scutellum pentagonal, the sides moderately elevated; color generally almost uniform brown; female genital lobes as viewed from above either very short, transverse (fig. 10a), or long and widely separated (fig. 11a) 12

Scutellum triangular, sides generally strongly elevated; color often variegated 13

12. Head longer than pronotum; sides of scutellum elevated to apex.

10. **behrensi** Bergroth

Head as long as pronotum; sides of scutellum scarcely elevated beyond middle 11. **robustus** Uhler

(a) Nearly uniform dark brown . . . variety **robustus** typical

(b) Narrow postero-lateral margins of pronotum, apex of scutellum and most of corium yellowish; abdomen reddish brown above.

variety **insignis** var. nov.

13. Width of third antennal segment about equal to one-half distance between eyes; size small, length, 4.6 mm. 7. **coarctatus** Heidemann

Width of third segment much less; larger, length over 5.4 mm. 14

14. Sides of pronotum serrate or toothed 15

Sides of pronotum entire or finely granulate 16

15. Third antennal segment more than twice longer than broad; second unicolorous or with very slight paleness at apex.

8. **fuscomaculatus** Stål

Third segment less than twice longer than broad.

9. **pannosus** Van Duzee

(a) Second antennal segment with a broad yellow ring at apex.

variety **pannosus** typical

(b) Second segment unicolorous variety **incomptus** var. nov.

16. Second antennal segment distinctly shorter than distance between eyes; only brachypterous form known 12. **intectus** sp. nov.

Second segment at least as long as distance between eyes; only macropterous forms known 17

17. Pronotum widest in basal third; rostrum reaching mesosternum; genital lobes short, truncate posteriorly 15. **apicalis** Van Duzee

Pronotum widest at or near middle; rostrum shorter; genital lobes long, rounded posteriorly 18

18. Sides of scutellum slightly raised, at middle lower than transverse basal elevation; pronotum widest behind middle; median carinae nearly parallel 13. **duzei** Bergroth

Sides of scutellum strongly raised, higher than basal elevation; pronotum widest at middle; median carinae sinuate 14. **implanus** sp. nov.

19. Antero-lateral margins of pronotum distinctly serrate, never deeply sinuate; corium (macrop.) always strongly dilated at base, never straight laterally.....20
 Margins of pronotum entire, sometimes evenly granulate, very rarely denticulate, often deeply sinuate; corium either dilated at base (the lateral margin sinuate) or not so dilated (the lateral margin straight).
 40
20. Third antennal segment almost three-fourths as long as second; color uniform dull black; length, 8.3 mm.....5. **montanus** Bergroth
 Third segment about one-half as long as second, or less.....21
21. Second antennal segment at middle almost or quite as thick as front femora; antennae bicolorous.....22
 Second segment at middle distinctly more slender than front femora, never with pale ring at middle.....23
22. Second antennal segment black; disc of scutellum dark in apical half.
 17. **depictus** Van Duzee
 Second segment brown, biannulate; disc of scutellum pale reddish.
 18. **concinus** Bergroth
23. Second antennal segment cylindrical, at least from near base to middle, often enlarged a very little near apex.....24
 Second segment distinctly clavate, gradually enlarging from near base to apex; rarely cylindrical in apical third (fig. 35c) or suddenly enlarged in apical third and about twice as thick at apex as at middle (fig. 35c).
 33
24. Second antennal segment longer than head.....26. **debilis** Uhler
 Second segment shorter than head.....25
25. Antennae very small, scarcely longer than head, slender; scutellum broad, sides arcuate, apical half pale (fig. 28d).....28. **parvicornis** sp. nov.
 Antennae much longer than head; scutellum otherwise.....26
26. Third antennal segment pale in apical two-thirds; disc of pronotum strongly elevated before and behind transverse depression; length, less than 6.8 mm.....27. **clinticornis** Bergroth
 Third segment unicolorous or narrowly pale at apex; disc of pronotum flat or as above.....27
27. Disc of pronotum rather flat, the transverse depression slight and ill-defined.....28
 Disc strongly elevated before and behind the very distinct transverse depression.....31
28. Pronotum widest at middle; sides of abdomen rather strongly crenate.
 22. **consors** sp. nov.
 Pronotum widest well behind middle; sides of abdomen entire or notched.
 29
29. Scutellum much longer than head.....21. **furvus** sp. nov.
 Scutellum not longer than head.....30
30. Granulation of head rough; length of second antennal segment about equal to width of head including one eye (rarely slightly longer); antero-lateral margins of pronotum usually straight, oblique, with variably coarse teeth; form elongate19. **proboscideus** Walker

- Granulation of head smooth; length of second segment at least equal to width of head including both eyes; sides of pronotum slightly arcuate, with very fine irregular teeth; form broad. . . . 20. **basalis** sp. nov.
31. Vertex finely and evenly granulate; lateral expansions of pronotum moderate, very narrow anteriorly, scarcely reflexed.
23. **persimilis** Van Duzee
- Vertex with two rows of coarse granules; lateral expansions wide, continued more broadly to anterior angles, somewhat reflexed... 32
32. Length of second antennal segment equal to head width including one eye; marginal teeth of pronotum large and irregular.
24. **medioximus** sp. nov.
- Length of second segment equal to head width including both eyes; marginal teeth small and even... 25. **vadosus** Van Duzee
33. Length of second antennal segment about equal to distance between eyes, rarely slightly greater... 20. **similis** Say
- (a) Third antennal segment yellowish except at base; membrane hyaline, often faintly maculated; apical angles of connexival segments pale... variety **similis** typical
- (b) Third antennal segment concolorous; membrane dark with pale basal spot, rarely entirely pale; general coloration nearly uniform light to dark brown.
- variety **centriguttatus** Bergroth
- Length of second antennal segment at least equal to head width including one eye... 34
34. Second antennal segment not or scarcely three times as long as third. 35
- Second segment distinctly more than three times as long as third... 37
35. Rostrum extending to middle of prosternum; second antennal segment about twice as long as third; antero-lateral margins of pronotum straight, oblique... 29. **opertaneus** sp. nov
- Rostrum extending to mesosternum; second antennal segment more than twice as long as third; sides of pronotum arcuate... 36
36. Color grayish, with obscure yellowish markings and a distinct pattern of pale granules; sides of pronotum with a few large teeth anteriorly; second antennal segment strongly clavate, its length equal to head width including both eyes... 32. **acutus** Say
- Color black; pronotal margins with numerous fine teeth; second antennal segment moderately clavate, shorter.
31. **shermani** Heidemann
37. Second antennal segment gradually enlarged from near base... 38
- Second segment cylindrical from base to near middle, strongly enlarged in apical third (fig. 36c)... 36. **approximatus** sp. nov
38. Second antennal segment nearly cylindrical beyond middle, sometimes very slightly enlarged at apex; third segment more slender than second at middle (fig. 35c); grayish granules of dorsal surface dense.
35. **hesperius** sp. nov.

Second segment evenly enlarged from near base to apex; third thicker than second at middle (cf. fig. 33c); grayish granules sparse if present.

39

39. Dorsal surface of pronotum nearly flat, the transverse depression slight; carinae feeble; sides scarcely reflexed; rostrum not reaching middle of mesosternum; color uniform reddish to grayish brown.

33. **inornatus** Uhler

Dorsal surface uneven, the transverse depression distinct; carinae well developed; antero-lateral margins of pronotum reflexed; rostrum extending nearly or quite to metasternum; coloration more or less distinctly variegated.....

34. **blaisdelli** Van Duzee

40. Corium strongly dilated at base width of hemielytra at this point usually distinctly greater than width of pronotum, even in brachypterous forms; pronotum sometimes widest well before middle.....

41

Corium slightly or not dilated at base, width about equal to that of pronotum; latter very rarely widest much before middle.....

47

41. Third antennal segment pale.

42

Third segment concolorous.....

43

42. Pronotum widest behind middle; second antennal segment slightly thicker than front femora

39. **insignitus** sp. nov.

Pronotum widest before middle; second segment distinctly more slender than front femora.

40. **uniformis** Heidemann

43. Second antennal segment almost cylindrical, about as long as head; hemielytra strongly narrowed or abbreviated; female much larger and broader than male.....

56. **orbiculus** Van Duzee

Second segment distinctly clavate, shorter than head; polymorphism not known to occur; sexes similar.....

44

44. Pronotum widest well behind middle (fig. 38d).

38. **borealis** Heidemann

Pronotum widest near middle (cf. fig. 37d).....

45

45. Second antennal segment slightly enlarged from near base; size large, length, 8 mm. or more.....

38. **compressus** Heidemann

Second segment cylindrical toward base, enlarged from near middle (cf. fig. 41c); smaller, length less than 8 mm.....

46

46. Color black, except spots of connexivum; sides of scutellum strongly and sharply elevated.....

41. **tuberculifer** Kirby

Color brown, corium marked with yellow; sides of scutellum moderately elevated.....

42. **parshleyi** Van Duzee

47. Scutellum distinctly pentagonal, broad, sides very strongly and sharply elevated; sides of pronotum parallel in basal half; length about 6 mm. or more.....

43. **funestus** Bergroth

Scutellum, and generally pronotal margins, otherwise; length less than 6 mm.....

48

48. Third antennal segment about two-thirds as long as second.....

49

Third segment distinctly less than two-thirds, usually not more than one-half as long as second.....

50

49. Antennae pale brown; antero-lateral margins of pronotum straight; male genital segment with ventral orifice (fig. 53h). 53. **falleni** Stål
Antennae black and white; antero-lateral margins of pronotum moderately sinuate; male segment without orifice... 54. **snowi** Van Duzee
50. Second antennal segment at base nearly as broad as an eye, strongly flattened, narrowed only at extreme base (fig. 46c) (South America).
46. **angustellus** Blanchard
Second antennal segment otherwise. 51
51. Antennae moderately robust, the second segment strongly narrowed in basal third (cf. fig. 44c)..... 52
Antennae slender, the second segment slightly and gradually enlarged from near base, sometimes rather abruptly thickened near apex (cf. figs. 49c, 52c) 53
52. Scutellum at middle narrower than corium at same level, the discal elevation extending beyond this point; female genital lobes convexly arcuate posteriorly (fig. 44e)..... 44. **lugubris** Fallen
(a) Apex of third and sometimes of second antennal segment white.
variety **lugubris** typical
(b) Antennae wholly black..... variety **nigricornis** Reuter
Scutellum at middle wider than corium, the discal elevation not extending beyond this point; female genital lobes concavely arcuate posteriorly (fig. 45e)..... 45. **arizonicus** sp. nov.
53. Pronotum widest well behind middle, the postero-lateral margins rounded or nearly parallel (cf. figs. 47d, 49d)..... 54
Pronotum widest slightly behind middle, the postero-lateral margins straight and distinctly convergent (cf. fig. 50d)..... 56
54. Antennae biannulate with white; corium not hyaline..... 55
Antennae not biannulate; corium largely hyaline, without distinct transverse veinlets..... 49. **gracilicornis** Stål
55. Genital lobes of female extending beyond second genital segment; male, fig. 47h)..... 47. **abbas** Bergroth
Genital lobes of female truncate, not extending beyond apex of second genital segment (fig. 48a); male unknown.. 48. **breviatus** Bergroth
56. Color brown, pronotum and corium extensively marked with yellow; length of second antennal segment equal to width of head between eyes..... 50. **marginatus** Uhler
Color black, pronotum concolorous; second segment longer 57
57. Third antennal segment pale in apical third; corium not hyaline.
51. **uniannulatus** sp. nov.
Third segment entirely black; corium largely hyaline.
52. **evermanni** Van Duzee
58. Antennae thicker than front femora; postocular tubercles obsolete... 59
Antennae more slender than front femora; postocular tubercles distinct.
60. **heidemanni** Bergroth

59. Length of second antennal segment about equal to two-thirds width of head between eyes; third segment enlarged toward apex; sides of scutellum feebly elevated; length of female less than 7 mm.

58. **niger** Stål

- Length of second segment more than three-fourths width of head between eyes; third cylindrical; sides of scutellum moderately but distinctly elevated; length of female more than 7 mm.

59. **nigrinus** sp. nov.

Subgenus **Aradus** Fabricius, Stål

1873. *Aradus (Aradus)* Stål, Enum. Hem., 3, p. 135.

Rostrum extending beyond base of head; pronotum of varied form, the lateral margins more or less explanate. This subgenus contains a great majority of the species of *Aradus*, among which are several that in certain respects form connecting links with *Quilnus*. The group *Pictosoma* Laporte is not represented among our species, in my opinion (see, p. 17), and therefore we are not concerned here with the question whether it is a good subgenus, as listed by Van Duzee,⁶ or a minor group under the subgenus *Aradus*, as Bergroth⁷ and Kiritshenko⁸ have it.

1. **Aradus (Aradus) aequalis** Say (Plate I, fig. 1.)

1832. *Aradus aequalis* Say, Het. Hem., p. 29; Compl. Writ. II, p. 352.

1903. *Aradus duryi* Osborn, Ohio Nat., IV, p. 39.

Distribution.⁹—QUEBEC: Montreal Island, V, 8, 1904. ONTARIO: Prince Edward County (Brimley). MAINE. VERMONT (P. S. Sprague). NEW YORK: Ithaca, IV, 25, 1913 (C. P. Alexander); McLean, V, 31, 1913. PENNSYLVANIA: Inglenook, V, 12, 1911 (H. B. Kirk); Wilmerding (M. Wirtner). DISTRICT OF COLUMBIA: Washington, IV, 2, 1905 (O. Heidemann). MARYLAND. VIRGINIA: Dead Run, IV, 21, 1916 (R. C. Shannon); near Plummer's Island, VI, 4, 1916 (R. C. Shannon). OHIO: Cedar Point; Cincinnati, IV, 30 (C. Dury); Cleveland (Hoff); Lancaster, V, 13, 1905 (T. P. White). ILLINOIS. [OKLAHOMA. TEXAS.]

Description.—Brown; broad lateral margins and posterior region of pronotum, margins of scutellum at middle, basal expansions of corium and neighboring veins, posterior margins of connexival segments, and inner margins of

⁶ Catal. Hemip., p. 135, 1917.

⁷ Canad. Ent., xxxviii, p. 198, 1906.

⁸ Faune Russic, Ins., Hemip., vi, livr. 1, p. 58, 1913.

⁹ The records are taken almost entirely from specimens which I have studied. In the few cases where I have borrowed published data, the fact is indicated by square brackets.

genital lobes, yellowish; membrane with irregularly reticulate pale markings; legs yellow, femora and tibiae with broad brown band at middle.

Head about equal in length and breadth, slightly shorter than pronotum on median line; tylus short, its sides parallel; impressions of vertex elongate, diverging anteriorly; preocular tubercles distinct; antenniferous spines stout, moderately divergent, without lateral tooth; postocular tubercles obsolescent; antennae (fig. 1c) moderately slender, cylindrical, somewhat shorter than head and pronotum together, the first segment reaching middle of tylus, the second about as long as distance between eyes; rostrum extending a little beyond base of prosternum. Pronotum (fig. 1d) with lateral margins very finely crenulate; median carinae strongly elevated. Scutellum longer than pronotum (45 to 33), elongate, triangular, with short median carina at base; lateral margins scarcely elevated. Hemelytra (♂) extending nearly to apical angles of sixth abdominal segment, connexivum moderately exposed, corium reaching beyond middle of fourth segment; hemelytra (♀) to genital segment, connexivum broadly exposed, corium to base of fourth; exocorium very strongly expanded at base; mesocorium with two or three distinct transverse veins, endocorium with one or two. Abdomen ovate, broad, the lateral margins almost entire.

♂ (fig. 1b). Fifth ventral segment one-half as long as sixth; genital segment short, moderately convex. Length, 8.4 mm.

♀ (fig. 1a). Posterior margin of dorsal genital segment truncate at middle. Length, 9 to 10 mm.

Type specimens (Indiana) lost.

This large and rare species is easily distinguished by antennal, pronotal, and genitalic structure. It is normally fully winged, but one specimen in the Cornell University collection is incipiently brachypterous. The hemelytra are moderately narrowed and shortened, considerably less so than in *intectus* (fig. 12d), and extend nearly to the posterior margin of the fifth abdominal segment; the corium is little modified except in length, extending somewhat beyond the middle of the third segment; the membrane is about half the normal size, with somewhat reduced venation. Short hind wings are present and the posterior lobe of the pronotum exhibits a slight flattening.

2. *Aradus (Aradus) crenatus* Say (Plate I, fig. 2.)

1832. *Aradus crenatus* Say, *Het. Hem.*, p. 28; *Compl. Writ.*, II, p. 350.

Distribution.—QUEBEC: Hemmingford, VIII, 30, 1916 (J. I. Beaulne); Montreal, VIII, 1901. ONTARIO: Grimsby; Ottawa, IX, 23, 1907 (C. H. Young); Preston (H. Groh); Ridgeway (Kilman). NEW YORK: Catskill; Ithaca, V, 22, 1914; Keene Valley, Adirondacks, IX, 1917 (G. P. Engelhardt);

Roslyn, Long Island; West Point, VI, 3, 1911 (W. T. Davis). PENNSYLVANIA: Erie, VII, 1903 (M. Wirtner); Greensburg (Wirtner); Wilmerding (J. L. Zabriskie). DISTRICT OF COLUMBIA: Washington, I, 4, 1898 (O. Heidemann). MARYLAND: Cabin John, IV, 1908 (W. Palmer); Glen Echo, X, 18, 1901 (O. Heidemann); Plummer's Island, V, 18, 1905 (Barber & Schwarz). VIRGINIA: Dyke, V, 18, 1917 (A. Wetmore); Fortress Monroe, IV, 19, 1891 (H. Barber). NORTH CAROLINA: Black Mountains, V, 10; Tryon, IV, 4, 1903 (W. F. Fiske). GEORGIA: Atlanta. [ALABAMA.] MICHIGAN: Detroit, V, 1874; Washtenaw County, X, 1, 1916 (F. M. Gaige). OHIO: Cincinnati, VI, 13, 1902 (C. Dury); Columbus; Flint, IV, 10, (R. J. Sim); Jefferson, VIII, 17, 1915 (R. J. Sim); Old Fort, XI, 27, 1915. ILLINOIS: Chicago (C. T. Brues); Homer IV, 27, 1907 (C. A. Hart); Urbana IV, 14, 1907 (C. A. Hart). INDIANA. [MEXICO, Bergroth.] PALAEARCTIC REGION.

Description.—Dark to light brown; pronotum with irregular darker markings especially on median carinae, postero-lateral areas, and sometimes on anterior explanate margins; scutellum with dark brown markings, the sides pale at middle, or sometimes wholly black; corium dark along inner apical margin; connexival segments with a triangular patch of dark granules anteriorly and a smaller one posteriorly; sutures of abdominal segments black; antennae yellowish; legs yellowish, the femora and tibiae with broad medial and narrow apical or subapical dark annulations; ventral surface reddish brown, with paler mottling.

Head a little longer than broad (48 to 43), as long as pronotum; tylus short, broad, the sides parallel; impressions of vertex rather short, deep, almost parallel; preocular tubercles distinct, rather acute; antenniferous spines short, conical, moderately divergent, with distinct lateral tooth; antennae (fig. 2c) slender, cylindrical, shorter than head and pronotum together (80 to 91), the first segment extending well beyond middle of tylus, the second as long as distance between eyes; rostrum extending somewhat beyond middle of prosternum. Pronotum (fig. 2d) with lateral margins widely expanded and moderately reflexed, with irregular teeth anteriorly and fine ones posteriorly; carinae well elevated; transverse depression distinct; surface smooth posteriorly between carinae. Scutellum narrow, slightly longer than pronotum (50 to 48); sides strongly elevated, nearly parallel in basal third, then sinuate to acute apex; basal portion of disc very slightly elevated, with low median carina. Hemelytra (♂) strongly narrowed from basal expansion to apex, disclosing abdominal disc at sides, extending to genital lobes, corium extending somewhat beyond middle of fourth segment; hemelytra (♀) similarly narrowed, reaching dorsal genital segment, corium to or somewhat beyond apex of third. Abdomen oval, broader in female, lateral margins variably crenate.

♂ (fig. 2b). Fifth and sixth ventral segments about equal in length; genital segment short, slightly convex, carinate, the lobes long, Length, 8 to 9 mm.

♀ (fig. 2a). Dorsal genital segment semicircular, the posterior margin almost straight. Length, 9.5 to 11 mm.

Type specimens (United States) lost.

A species of wide distribution, sometimes locally common, distinguished by its large size, antennal structure, strongly crenate abdomen, and very coarse granulation. Sometimes taken in sifting the rotten wood of dead stumps. Comparison with numerous European specimens discloses no differences of specific value.

3. *Aradus (Aradus) quadrilineatus* Say (Plate I. fig. 3.)

1823. *Aradus quadrilineatus* Say, Journ. Acad. Nat. Sci. Philadelphia, iv, p. 326; Compl. Writ., II, p. 249.

Distribution.—QUEBEC: Hudson, V, 22, 1915 (J. I. Beaulne); Montreal Island, V, 21, 1904; Ottawa, VIII, 8, 1912; Val Morin. ONTARIO: Grimsby; Picton, V, 27, 1901 (J. D. Evans); Toronto, IV, 24, 1898 (E. P. Van Duzee). MAINE: Holden, VI, 17, 1902 (F. A. Eddy); Monmouth (O. O. Stover); Mount Katahdin, VIII, 19, 1902 (H. G. Barber); Orono, V, 20, 1914; Paris, VII, 10, 1914 (C. A. Frost). NEW HAMPSHIRE: Claremont; Concord; Durham; Franconia (A. T. Slosson); Mount Washington, Glen House, IX, 22, 1907 (O. Bryant), summit, (A. T. Slosson); Webster (W. F. Fiske). MASSACHUSETTS: Amherst; Boston, IV, 30, 1903 (H. M. Parshley); Leeds, IV, 6, 1919 (J. R. de la Torre-Bueno and H. M. P.); Natick, XI, 1, 1900. RHODE ISLAND: Providence, V, 7, (C. A. Davis); Warwick, V, 26. CONNECTICUT: Hartford, V, 11, 1914 (W. Marchand); Saybrook, IV, 25, 1913 (D. J. Caffrey); S. Meriden, V, 10, 1914 (H. L. Johnson). NEW YORK: Buffalo, X, 27, 1901 (E. P. Van Duzee); Clove Valley, Staten Island, V, 6, 1916 (W. T. Davis); Colden, V, 30, 1902 (E. P. Van Duzee); Fort Montgomery, V, 30, 1903; Hamburg, VI, 21, 1908 (E. P. Van Duzee); Ithaca, IV, 5, 1910 (C. R. Plunkett); Lake George, VII, 9, 1905 (J. L. Zabriskie); Niagara Falls, IV, 25, 1909 (E. P. Van Duzee); Schenectady, VIII, 22, 1908; Sloatsburg, XI, 8, 1914; Southfields, V, 3, 1914 (F. M. Schott); West Point, VI, 4, 1911 (W. T. Davis); Whiteface Mountain, top, VII, 10, 1914 (W. T. Davis); White Plains, IV, 11, 1914 (J. R. de la Torre-Bueno); Rockaway Beach, Long Island, V, 25, 1912 (H. G. Barber). NEW JERSEY: Overbrook, V, 30, 1907; Plainfield, IV, 26 (A. Nicolay); Roselle Park, V, 3, 1911 (H. G. Barber); Schooley's Mountains, Hackettstown, V, 21, 1910; Summit, X, 26, 1913 (F. M. Schott); Vineland, IV, 25 (H. B. Weiss). PENNSYLVANIA, Greensburg (M. Wirtner); Jeanette; North Mountain, IX, 2 (C. W. Johnson); Pittsburg, VIII, 1905. DISTRICT OF COLUMBIA: Brightwood, IV, 5, 1903 (O. Heidemann). MARYLAND. VIRGINIA: Warm Springs, X, 1900 (W. T. Davis); West Falls Church (N. Banks). NORTH CAROLINA. [FLORIDA.] LOUISIANA, Orelousus, V. MICHIGAN: Steere, Washtenaw County, V, 14, 1919 (R. F. Hussey). OHIO: Cedar Point; Columbus, IV, 6, 1913 (H. Osborn); Jefferson, VIII, 17, 1915 (R. J. Sim); Old Fort, X, 27, 1915. INDIANA: Hessville, V, 3, 1909 (W. J. Gerhard); Mineral Springs, X, 2, 1910

(W. J. Gerhard). ILLINOIS: Algonquin, V, 6, 1897 (C. A. Hart); Glen Ellen, VI, 18, 1905 (A. B. Walcott); Muncie, IV, 29, 1905 (C. A. Hart); Palos Park, VI, 20, 1909 (W. J. Gerhard). IOWA: Ames (H. Osborn). MANITOBA: Aweine, V, 9, 1915 (N. Criddle). WISCONSIN: Beaver Dam, VI, 17, 1911 (W. E. Snyder). MISSOURI. KANSAS: Douglas County, V (E. S. Tucker). ALBERTA: Edmonton, V, 9, 1919 (F. S. Carr). NORTHWEST TERRITORY: Great Bear Lake. PANAMA.

Description.—Dark brown to black, apex of second antennal segment and posterior connexival angles pale; membrane black, with irregular reticulate white markings; trochanters pale; tibiae with apical and subbasal, and femora with subapical pale rings; ventral surface brown, with lateral pale marks and light spiracles.

Head very slightly longer than broad, slightly longer than pronotum; tylus rather broad, the sides parallel; impressions of vertex elongate, parallel; preocular tubercles obsolete; antenniferous spines moderately acute, slightly divergent, the lateral tooth slight or absent; postocular tubercles obsolete; antennae (fig. 3c) moderately robust, somewhat shorter than head and pronotum together, the first segment extending beyond middle of tylus, the second shorter than distance between eyes (22 to 25); rostrum reaching base of prosternum. Pronotum (fig. 3d) with lateral margins finely and irregularly denticulate, widely expanded, reflexed; carinae strongly elevated. Scutellum longer than pronotum (45 to 30), elongate, triangular, sides strongly raised. Hemelytra extending (σ) to apical angles of sixth abdominal segment, (φ) to middle of dorsal genital segment; corium almost or quite to middle of fourth segment; exocorium moderately expanded at base, mesocorium with one, endocorium without well developed transverse veins; connexivum broadly exposed. Abdomen oval, moderately crenate.

σ (fig. 3b). Fifth ventral segment as long as sixth; genital segment moderately convex. Length, 7.5 to 8 mm.

φ (fig. 3a). Posterior margin of dorsal genital segment very slightly emarginate at middle. Length, 8 to 9 mm.

Type specimens (Missouri) lost.

This is a common and widely distributed species of large size, distinguished especially by antennal and genitalic structure. An occasional specimen exhibits incipient brachyptery, having the hemelytra about twice as long as the scutellum, venation distinct, short hind wings present, and the pronotum a little depressed before base of scutellum.

4. *Aradus (Aradus) ampliatus* Uhler (Plate I, fig. 4.)

1876. *Aradus ampliatus* Uhler, Bull. U. S. Geol. Geog. Surv., I, p. 321.

1893. *Aradus ampliatus* Uhler, Proc. Ent. Soc. Washington, II, p. 381.

Distribution.—[UTAH: Alta, VII, 1, 1891 (E. S. Schwarz) *sec.* Uhler.] CALIFORNIA: Placer County, IV, 1905; Sierra (J. Behrens).

Description.—Opaque black; third antennal segment in apical half bright orange; apical angles of connexival segments and inner half of genital lobes with narrow margin of dorsal genital segment at middle, reddish yellow; legs black, the coxae, base and sub-apical ring of femora, apex of tibiae, and tarsi brownish yellow; rostrum and most of ventral surface dark reddish brown.

Head slightly longer than broad (40 to 38), about equal in length to pronotum; tylus short, tapering in apical half; impressions of vertex deep, divergent; preocular tubercles very large, conical, moderately acute; antenniferous spines rather short, slender, moderately divergent, with very small lateral tooth; postocular tubercles rough, prominent, acute; antennae (fig. 4c) moderately slender, cylindrical, slightly longer than head and pronotum together (85 to 80), the first segment extending well beyond middle of tylus, the second almost as long as width of head including eyes; rostrum extending over anterior fourth of mesosternum. Pronotum (fig. 4d) rather flat, lateral margins finely and irregularly denticulate, broadly expanded and reflexed; carinae very strongly elevated. Scutellum elongate, triangular, much longer than pronotum (65 to 40); sides strongly elevated except toward apex, nearly straight, more strongly convergent in apical fourth; apex obtuse; basal portion of disc slightly and unevenly elevated. Hemicyclia (♀) moderately narrowed, exposing a little of abdominal disc at sides, extending to middle of dorsal genital segment, the corium to base of fourth; exocorium widely and evenly expanded and reflexed at base; mesocorium and endocorium with one or two distinct transverse veins; membrane with very few cross-veins. Abdomen broadly ovate.

♂. Unknown.

♀ (fig. 4a). Posterior margin of dorsal genital segment straight; genital lobes very short, transverse, as viewed from above. Length, 11 to 11.3 mm.

Type specimen (Sierra, California) in the Uhler Collection, U. S. N. M., No. 24078, lectotype.

One of our largest and handsomest species, of which only a few specimens exist in collections. Coloration, antennal structure, and the female genital characters provide ready means of identification.

5. *Aradus (Aradus) montanus* Bergroth (Plate I, fig. 5.)

1913. *Aradus montanus* Bergroth, Can. Ent., XLV, p. 1.

Distribution.—QUEBEC: St. Hilaire, VI. COLORADO: Leadville, 10,000 to 11,000 ft., VII, 7 to 14, 1896 (H. F. Wickham).

Description.—Black or brownish black.

Head as long as broad, slightly longer than pronotum (32 to 29); tylus rather short, enlarged toward base; impressions of vertex short and broad, rather shallow, parallel; preocular tubercles very small, obtuse; antenniferous spines short, evenly conical, moderately divergent, with distinct lateral tooth; postocular tubercles prominent, acute; antennae (fig. 5c) moder-

ately robust, shorter than head and pronotum together (54 to 62), the first segment reaching apical third of tylus, the second slightly shorter than distance between eyes (20 to 21); rostrum extending slightly beyond middle of prosternum, the apical segment slender. Pronotum (fig. 5d) rather flat, the lateral margins irregularly and finely crenulate, well expanded and a little reflexed; carinae slightly elevated. Scutellum elongate, much longer than pronotum (48 to 30), sides straight and slightly convergent to apical third, then slightly arcuate to rather broad apex, not strongly elevated; basal two-fifths of disc slightly elevated, with very low median carina extending nearly to middle. Hemelytra (♀) but slightly narrowed toward apex, extending to middle of dorsal genital segment, corium to base of fourth; exocorium moderately expanded and reflexed at base; mesocorium with one, endocorium without distinct transverse veins.

♂. Unknown.

♀ (fig. 5a). Posterior margin of dorsal genital segment transverse, with a rather deep rounded notch at middle; abdomen rather broad, oblong-oval, widest at fourth segment. Length, 8.3 mm.

Type specimen (Leadville, Colorado) in Bergroth's collection.

Of this species but two specimens are known, the type, which I have examined, and a perfectly similar example from Quebec, in my collection. In describing the species Bergroth (1913) writes: "A plain-looking species, but not closely allied to any described North American form." It is peculiar in color and all structural characters and forms one of the isolated groups which it seems necessary to place at the head of the genus.

6. *Aradus (Aradus) ornatus* Say (Plate I, fig. 6.)

1832. *Aradus ornatus* Say, Het. Hem., p. 29; Compl. Writ., II, p. 352.

1892. *Aradus ornatus* Bergroth, Proc. Ent. Soc. Washington, II, pp. 332, 334.

Distribution.—PENNSYLVANIA. DISTRICT OF COLUMBIA: Washington, V, 26, 1897 (O. Heidemann). MARYLAND: Plummer's Island, VII, 15, 1907 (E. A. Schwarz). VIRGINIA. OHIO: Cincinnati (C. Dury). INDIANA.

Description.—Dark brown, the hemelytra except clavus and the abdomen pale; head, disc of pronotum anteriorly, and base of scutellum covered with brown granules; posterior portion of pronotum polished black between the carinae; extreme apex of scutellum usually yellow; corium yellowish white, with narrow lateral margin or submargin and apex dark brown, and a few small, scattered dark spots; clavus brown; membrane yellowish white with faint maculation; abdomen pale reddish yellow, a narrow submarginal stripe and apical half of genital lobes dark brown; rostrum pale, the apex darker; legs yellowish or pale reddish, femora and tibiae with broad dark ring at middle; ventral surface of abdomen pale, the disc darker anteriorly, a few small spots and interrupted median vitta brown.

Head broader than long (28 to 25), longer than pronotum (25 to 22); tylus short, slightly narrowed from base to apex; impressions of vertex short, triangular; preocular tubercles obsolete; antenniferous spines very stout, conical, very slightly divergent, without lateral tooth; postocular tubercles very low, rounded; antennae (fig. 6c) very robust, shorter than head and pronotum together (42 to 47), the first segment extending to apex of antenniferous spines and well beyond the middle of tylus, the second shorter than distance between eyes (17 to 20); rostrum extending to middle of prosternum. Pronotum (fig. 6d) with lateral margins crenulate and but slightly reflexed; carinae strongly raised, the surface between them without granules posteriorly. Scutellum longer than pronotum (26 to 22), broadly triangular, sides straight, moderately elevated; a slightly elevated transverse carina at base. Hemelytra (♂) nearly parallel beyond middle, narrower than disc of abdomen, extending to middle of genital lobes; (♀) a little broader, extending to middle of dorsal genital segment; corium reaching about to middle of fourth; exocorial dilation extreme, almost semicircular; mesocorium with one, endocorium without well defined transverse veins. Abdomen broadly oval, sides notched, not crenate.

♂ (fig. 6b). Fifth ventral segment as long as sixth; genital segment strongly convex, the lobes rather short. Length, 5.4 mm.

♀ (fig. 6a). Posterior margin of dorsal genital segment straight, transverse. Length, 6 to 6.3 mm.

Type specimens (Indiana) lost.

This rare species is one of the most beautiful of the American forms; as Say remarks, it is well distinguished by the polished pronotal spots and by its coloration. Bergroth (1892) was the first modern author to recognize it.

7. *Aradus (Aradus) coarctatus* Heidemann (Plate I, fig. 7.)

1907. *Aradus coarctatus* Heidemann, Proc. Ent. Soc. Washington, VIII, p. 69.

Distribution.—CALIFORNIA: Cazadero, Sonoma County, IV, 14, 1918, IX, 7, 1918 (E. P. Van Duzee); Los Angeles (D. W. Coquillett); Mountains near Claremont (C. F. Baker).

Description.—Dark brown, narrow posterior margins of pronotal lobes, basal expansions except margin, and cells, in large part, of corium, and extreme apex of scutellum, yellowish; connexivum with outer half, or at least apical angles of segments, dull reddish yellow; inner margins of genital lobes narrowly pale; legs brown, the femora and tibiae pale at base and apex; ventral surface of abdomen reddish brown, with rows of small spots and base of genital segment pale; membrane brown, the veins and veinlets white.

Head as long as broad, longer than pronotum (24 to 20); tylus rather narrow, the sides nearly parallel; impressions of vertex short, deep, slightly divergent anteriorly, connected by a posterior depression; preocular tubercles distinct, acute; antenniferous spines stout, conical, with distinct

lateral tooth; postocular tubercles obtuse; antennae (fig. 7c) roughly scabrous, very robust, almost as long as head and pronotum together (40 to 44), the first segment extending to middle of tylus, the second as long as distance between eyes; rostrum extending to base of prosternum. Pronotum (fig. 7d) rather flat, sides with coarse teeth anteriorly; carinae strongly elevated, coarsely granulate. Scutellum longer than pronotum (29 to 20), rather broadly triangular, sides straight, parallel at extreme base, strongly and sharply elevated; basal elevation transverse, narrow, sharply marked off from the depressed disc. Hemelytra (σ) extending to base of genital segment, narrowed from basal expansion, exposing disc of abdomen at sides; corium extending to middle of fourth; exocorium moderately but distinctly dilated; mesocorium with one, endocorium without distinct transverse veins, but somewhat roughened.

σ (fig. 7b). Fifth ventral segment about as long as sixth; genital segment strongly convex, the lobes short. Abdomen broadly obovate, widest behind the middle, sides with minute notches. Length, 4.4 to 4.6 mm.

ϕ . Unknown.

Type specimen (California), United States National Museum, No. 9867; paratypes, United States National Museum and Cornell University collection.

This species, somewhat related to *ornatus*, is readily distinguished by its small size, very robust antennae, coloration, and pronotal structure. It has been found very seldom.

8. *Aradus (Aradus) fuscomaculatus* Stål (Plate I, fig. 8.)

1859. *Aradus fuscomaculatus* Stål, Freg. Eugen. Resa, Ins. Hem., p. 260.

1873. *Aradus fusconnulus* Stål, Enum. Hem., 3, p. 136.

Distribution.—BRITISH COLUMBIA: Departure Bay, VI, 6, 1908 (G. W. Taylor); Malahat, V, 29, 1917 (R. C. Treherne); North Bend, VI, 7; Victoria, Vancouver Island. WASHINGTON: Hoquiam (Burke); Tenino, V, 29, 1893. OREGON: Dilley. CALIFORNIA: Big Basin Rock, Santa Cruz County, V, 12, 1918 (L. S. Slevin); Carmel, IV, 20, 1918 (L. S. Slevin); Fieldbrook, V, 26, 1903 (H. S. Barber); Lagunitas, IV, 24, 1910 (E. C. Van Dyke); Mount Tamalpais, Marin County, IX, 19, 1909 (E. C. Van Dyke); Santa Cruz Mountains; Sonoma County.

Description.—Brown, with variable pale yellowish markings on expanded margins of pronotum and on corium especially at base; posterior ends of median carinae and sometimes narrow postero-lateral margins of pronotum, and extreme apex of scutellum, yellow; second antennal segment rarely a little yellowish at base and apex; depressed portion of scutellum black; connexivum irregularly variegated, the posterior and extreme lateral margins and sometimes most of disc of connexival segments yellowish; membrane with more or less conspicuous white reticulation; inner margins of genital lobes yellow; legs brown, the coxae, trochanters, subapical ring of femora

and basal and apical rings of tibiae, yellowish; sternum and most of ventral surface of abdomen reddish brown.

Head as long as broad, longer than pronotum (30 to 24); tylus moderately compressed, slightly enlarged at middle; impressions of vertex elongate, deep, parallel; preocular tubercles distinct; antenniferous spines moderately stout and divergent, the lateral tooth slight or absent; postocular tubercles of moderate size; antennae (fig. 8c) robust, almost as long as head and pronotum together (48 to 53), the first segment reaching middle of tylus, the second about as long as distance between eyes; rostrum extending beyond apex, sometimes almost to middle of mesosternum. Pronotum (fig. 8d) with sides finely crenulate, bearing anteriorly a few large teeth which may be obsolescent; carinae well elevated, rather roughly granulate. Scutellum longer than pronotum (36 to 24), triangular, with distinct transverse elevation at base; sides strongly elevated and sometimes very slightly curved. Hemelytra (σ) extending to genital lobes, (φ) to middle of dorsal genital segment, narrowed (σ φ), exposing disc of abdomen at sides, corium nearly to base of fourth; exocorium moderately expanded; mesocorium with one, endocorium without distinct transverse veins. Abdomen broadly ovate, the lateral margins entire.

σ (fig. 8b). Fifth ventral segment about as long as sixth; genital segment moderately convex. Median carinae of pronotum less strongly divergent at base than in female. Length, 5.5 to 6 mm.

φ (fig. 8a). Posterior margin of dorsal genital segment nearly straight at middle; genital lobes projecting considerably as viewed from above. Length, 6.5 to 6.7 mm.

Type specimens (California) probably in the Stockholm Museum.

This distinctively western species is distinguished from allied forms by its coloration, details of antennal and pronotal structure, and the genital characters. It seems to be moderately common on the Pacific Coast.

9. *Aradus (Aradus) pannosus* Van Duzee (Plate I, fig. 9.)

1920. *Aradus pannosus* Van Duzee, Proc. California Acad. Sci. (1), ix, p. 332.

Distribution.—CALIFORNIA: Berkeley, I, 8, 1919 (H. Dietrich), II, 2, 1915 (E. P. Van Duzee); Marin County, XII, 27, 1915 (H. Dietrich).

Description.—Dark brown, variegated about as in the preceding; second antennal segment with a broad yellow ring at apex.

Head about as long as broad, longer than pronotum (28 to 22); impressions of vertex rather broad, slightly divergent anteriorly; preocular tubercles distinct; antenniferous spines short, very stout, moderately divergent, the lateral margin irregular; postocular tubercles slightly developed; antennae (fig. 9c) robust, shorter than head and pronotum together (40 to 48), the first segment reaching middle of tylus, the second slightly longer than distance

between eyes (20 to 19); rostrum extending over anterior fourth of mesosternum. Pronotum (fig. 9d) with lateral margins finely crenulate posteriorly, a few large teeth anteriorly; carinae strongly elevated. Scutellum longer than pronotum (35 to 22), structure as in the preceding except that the disc is less strongly depressed. Hemelytra about as in the preceding.

♂ (fig. 9b). Fifth ventral segment about as long as sixth; genital segment short, moderately convex, the lobes rather long; abdomen broadly obovate, widest well behind middle, margins entire. Length, 5.5 mm.

♀ (fig. 9a). Posterior margin of dorsal genital segment sinuate, shallowly emarginate at middle; genital lobes short as viewed from above; projecting a distance less than one-half their breadth; abdomen almost circular, apices of the segments a little prominent; connexival segments transversely ridged. Length, 6 mm.

Type specimen (Berkeley, California) in the collection of the California Academy of Sciences.

This Californian species, while rather closely related to *fusco-maculatus*, is well distinguished by the proportions of the antennal segments, by its genital characters, and, in the typical form, by the coloration of the antennae.

***Aradus pannosus* variety *incomptus* var. nov.**

Like the typical form except in the absence of the apical ring of the second antennal segment.

Holotype.—♀; Marin County, California, XI, 8, 1919 (H. Dietrich), in my collection.

Paratypes.—Females; same data as holotype, and XII, 27, 1919, in my collection.

This is a well-marked form of true varietal rank, since it occurs in the same region as the typical and exhibits intergradation, as indicated by one of the paratypes which shows slight traces of pale color at the apex of the second antennal segment.

10. *Aradus* (*Aradus*) *behrensi* Bergroth (Plate I, fig. 10.)

1886. *Aradus Behrensi* Bergroth, Wiener Ent. Zeit., v, p. 97.

Distribution.—BRITISH COLUMBIA: Malahat, V, 29, 1917 (R. C. Treherne); Yale, V, 26, 1918 (W. Downes). WASHINGTON: Tenino, V, 29, 1893; Olympia. OREGON: Corvallis, VII, 1917 (R. H. Smith); Hood River, V, 20, 1893. CALIFORNIA: Cazadero, IX, 2, 1918 (E. P. Van Duzee); Cisco, VII, 1911 (C. von Geldern); San Diego County, IX, 4, 1913 (E. P. Van Duzee); Upper Soda Springs, Shasta County (J. Behrens).

Description.—Brown to brownish black; first antennal segment, spots on basal expansion of corium and sometimes a few of the veins, extreme apex of scutellum, apical angles and sometimes apical margins of connexival seg-

ments, and narrow inner margins of genital lobes, pale reddish or yellowish brown; membrane dark, paler at base and sometimes along some of the veins; rostrum and legs paler, femora with broad median and narrow apical dark rings, tibiae with broad median dark band; ventral surface of abdomen dark brown, with obscure paler spots.

Head slightly broader than long (28 to 27), longer than pronotum (27 to 23); tylus rather short, enlarged at middle and again toward base; impressions of vertex rather broad, more or less distinctly semilunate, connected posteriorly; preocular tubercles distinct, obtuse or rarely subacute; antenniferous spines very short and stout, conical, the lateral tooth minute or absent; postocular tubercles obtuse, rounded; antennae (fig. 10c) moderately robust, minutely and evenly granulate, almost as long as head and pronotum together, the first segment extending a little beyond middle of tylus, the second as long as distance between eyes; rostrum extending about to base of prosternum. Pronotum (fig. 10d) with lateral margins rather strongly expanded and moderately reflexed, the lateral teeth usually coarse, variable, rarely almost obsolete; carinae distinctly elevated. Scutellum of rather variable shape, more or less distinctly pentagonal, broad, much longer than pronotum (35 to 23), sides moderately elevated, apex acute or rather obtuse; basal elevation transverse, obtusely carinate, extended a little posteriorly at middle. Hemicelytra (σ) extending to base of genital lobes, rather broad, covering abdominal disc, (φ) reaching about to middle of dorsal genital segment, more strongly narrowed; corium extending about to middle of fourth connexival segment; exocorium moderately expanded, mesocorium with one, endocorium with one to several distinct transverse veins.

σ (fig. 10b). Fifth ventral segment slightly longer than sixth (11-10); genital segment short, strongly convex, the lobes short, truncate; abdomen oval. Length, 5.2 to 5.7.

φ (fig. 10a). Posterior margin of dorsal genital segment shallowly emarginate at middle; abdomen broadly oval, sometimes almost circular. Length, 6 to 7 mm.

Type specimens (Upper Soda Springs, California) in Bergroth's collection.

This Pacific Coast species, the types of which Dr. Bergroth has kindly sent to me for study, is variable in details of coloration and of pronotal and scutellar structure, as well as in the shape of the female abdomen. It is readily distinguished from close allies by the structure of the antennae, general shape of the pronotum, and genitalic features. Van Duzee¹⁰ describes two incipiently brachypterous examples, in which the hemicelytra extend to the base of the fifth abdominal segment.

¹⁰ Univ. of Cal., Tech. Bulls., Ent., 1, p. 233, 1916.

11. *Aradus* (*Aradus*) *robustus* Uhler (Plate II, fig. 11.)

1871. *Aradus robustus* Uhler, Proc. Boston Soc. Nat. Hist., xiv, p. 104.

Distribution.—QUEBEC: St. Hilaire, V, 24, 1906 (G. Beaulieu). ONTARIO: Prince Edward County, V, 28, 1916 (J. F. Brimley); Ridgway (Kilman). MAINE: Manchester (O. O. Stover); Monmouth, VI, 27, 1901 (C. A. Frost); Orono, IV, 24, 1914 (H. M. Parshley). NEW HAMPSHIRE: Three Mile Island, V, 27, 1908 (F. Blanchard). MASSACHUSETTS: Cambridge, X, 12; Forest Hills, V, 26, 1916 (A. M. Wilcox); Holyoke, XI, 12, 1903 (F. Knab); Milton, V, 20, 1829 (Harris Coll.); Northampton, V, 4, 1919 (H. M. Parshley). NEW YORK: Huntington, Long Island, II, 23, 1913 (F. M. Schott); Long Beach, Long Island, V, 7, 1911 (J. R. de la Torre-Bueno); Batavia, V, 17, 1914 (H. H. Knight); Colden, V, 5, 1901 (E. P. Van Duzee); De Bruce, VII, 6, 1916 (W. T. Davis); Gowanda, VIII, 2, 1907 (E. P. Van Duzee); Fort Montgomery, V, 31, 1903; Ithaca, IV, 5, 1910 (C. R. Plunkett); Orleans County, VI, 4, 1916 (W. T. Davis); Whiteface Mountain, top, VII, 10, 1914 (W. T. Davis); White Plains, XII, 15, 1912 (J. R. de la Torre-Bueno). NEW JERSEY: Caldwell, IX, 5, 1914 (F. M. Schott); Camden, XI, 23; Fort Lee, VII; Roselle Park, V, 15, 1910 (H. G. Barber). PENNSYLVANIA: N. Cumberland, V, 5; Rockville, V, 27. DELAWARE. DISTRICT OF COLUMBIA: Washington, IV, 18, 1897 (O. Heidemann). MARYLAND: Plummers Island, X, 8, 1905 (O. Heidemann). NORTH CAROLINA: Cape Hatteras, I, 1903 (F. Sherman). TENNESSEE. FLORIDA: Jacksonville. MICHIGAN: Agricultural College; Alma, V, 29, 1918 (L. A. Stearns). OHIO: Ashtabula County; Cincinnati, VI, 25, 1905 (C. Dury); Peebles, V, 16, 1903. INDIANA: Hessville, V, 30, 1909 (W. J. Gerhard). ILLINOIS: Havana, V, 17, 1912 (C. A. Hart); Urbana, IV, 11, 1892 (McElfresh); White Heath, III, 24, 1917 (C. A. Hart); Willow Springs, VI, 13, 1909 (W. J. Gerhard). WISCONSIN: Beaver Dam, VI, 12, 1911 (W. E. Synder). MINNESOTA: Minneapolis, V, 10, 1920 (R. F. Hussey). IOWA: Ames (H. Osborn). NORTH DAKOTA: Devil's Lake, VII, 22, 1920 (T. H. Hubbell). MISSOURI: Kansas City, IV, 28, 1897 (F. J. Hall). NEBRASKA: Ashland. KANSAS: Douglas County, V (F. H. Snow); Onaga, IV, 23, 1901 (Crevecoeur). TEXAS (Belgrave). NORTHWEST TERRITORY.

Description.—Nearly uniform dark brown; veins of corium and the membrane with very vague paler markings; tibiae with subbasal and subapical pale rings.

Head broader than long (30 to 25), equal in length to pronotum; tylus rather narrow; impressions of vertex triangular; preocular tubercles absent; antenniferous spines very large, stout, without lateral tooth; postocular tubercles large, rounded; antennae (fig. 11c) very robust, fusiform as a whole, a little shorter than head and pronotum together, the first segment reaching apex of antenniferous spines and a little beyond middle of tylus, the second shorter than distance between eyes (9 to 13); rostrum extending somewhat beyond middle of prosternum. Pronotum (fig. 11d) flat, the carinae slightly elevated. Scutellum longer than pronotum (32 to 25), pentagonal, the sides slightly elevated; disc transversely elevated at base. Hemelytra (σ) ex-

tending nearly to apex of abdomen, corium to apex of fourth connexival segment, (♀) to base of dorsal genital segment, corium to base of fourth; connexivum broadly exposed. Abdomen broadly oval.

♂ (fig. 11b). Fifth ventral segment somewhat shorter than sixth; genital segment short, strongly convex. Length, 5.5 to 6 mm.

♀ (fig. 11a). Posterior margin of dorsal genital segment very slightly emarginate at middle. Length, 6.5 to 7 mm.

Type specimen (Milton, Massachusetts), Harris Collection, No. 82, Boston Society of Natural History.

This common and widely distributed species is easily recognized by the very stout antennae, pronotal shape, and nearly uniform coloration, as well as scutellar and genitalic structure.

***Aradus robustus* variety *insignis* var. nov.**

Similar to the typical form, except in coloration; pronotum dark brown, the granulation variable, light to dark, the postero-lateral margins pale yellowish; corium except apex and some variable markings, and apex of scutellum, yellowish; dorsal surface of abdomen reddish brown, of variable shade.

Holotype.—♀; Texas (Pergande Coll.), United States National Museum, No. 24072.

Allotype.—♂; Texas (Belfrage), United States National Museum.

Paratypes.—Females; Ashland, Nebraska, in my collection; Cape Hatteras, North Carolina, January, 1903 (F. Sherman), in North Carolina Experiment Station collection, Brownsville, Texas, XII, 16, 1911 (C. A. Hart), Illinois State Natural History Survey collection; Ann Arbor, Michigan, V, 24, 1919 (M. H. Hatch).

This variety is distinguished by its conspicuously variegated coloration, but is connected with the typical form by occasional specimens of the latter having the apex of the scutellum pale, etc. Although rare, there are enough examples known to indicate that it has no geographical significance.

12. *Aradus* (*Aradus*) *intectus* sp. nov. (Plate II, fig. 12.)

Description.—Blackish brown; chief veins of hemelytra, apex of scutellum, apical angles of connexival segments, and narrow inner margins of genital lobes, very obscurely pale; corium sometimes largely pale; rostrum and legs moderately light brown.

Brachypterous form.—Head about as broad as long, longer than pronotum (26 to 21); tylus somewhat narrowed from base to apex; impressions of vertex broad, shallow, ill-defined, connected posteriorly; base of head with

a narrow, smooth, pale, transverse lunule; preocular and postocular tubercles obsolescent; antenniferous spines very short and stout, conical, without lateral tooth, slightly divergent; antennae (fig. 12c) stout, about as long as head and pronotum together, the first segment extending a little beyond middle of tylus, the second almost as long as distance between eyes, slightly longer than third; rostrum extending to middle of mesosternum. Pronotum (fig. 12d) flattened, the lateral margins moderately expanded and reflexed, minutely granulate; carinae distinctly elevated. Scutellum (fig. 12d) narrow, longer than head (28 to 26), much longer than pronotum (28 to 21); sides moderately thickened and elevated except at extreme apex; disc with low rounded elevation before middle. Hemelytra (♀) (fig. 12d) narrowed and abbreviated, extending almost or quite to fifth abdominal segment in median line, corium to base of fifth.

♂. Unknown.

♀ (fig. 12a). Dorsal genital segment twice as wide as long, the posterior margin transverse, shallowly emarginate at middle between the distant genital lobes. Length, 6 mm

Holotype.—♀; Fort Collins, Colorado (E. D. Ball), in the Heidemann collection, Cornell University, No. 550.1.

Paratype.—♀; Douglas, Wyoming, in American Museum of Natural History.

This species, of which only the brachypterous form is known, is related to *robustus* in the structure of the antennae and of the female genital plates, and to *duzeesi* in pronotal characters. It is very distinct in its particular combination of characters, especially in the form of the dorsal genital segment and genital lobes, as viewed from above (fig. 12e). In the group to which it belongs pterygo-polymorphic species are exceedingly rare.

13. *Aradus* (*Aradus*) *duzeesi* Bergroth (Plate II, fig. 13.)

1892. *Aradus Duzeei* Bergroth, Proc. Ent. Soc. Washington, II, p. 333.

Distribution.—QUEBEC: Montreal Island, IV, 15, 1906 (G. Beaulieu). ONTARIO: Muskoka (Van Duzee); Ridgeway (Van Duzee). MASSACHUSETTS: Northampton, V, 17, 1919 (Dorothy Merchant). NEW YORK: Ithaca; Rochester (G. Wendt). NEW JERSEY: Orange Mountains, V, 24, 1903 (H. G. Barber). PENNSYLVANIA: Inglenook, V, 19, 1912; Pittsburgh; Wilmerding (M. Wirtner). MARYLAND: Plummer's Island, V, 30, 1907 (W. L. McAtee). VIRGINIA: near Plummer's Island, V, 28, 1916 (W. L. McAtee). OHIO: Oxford; Worthington, V, 9, 1902 (J. G. Sanders).

Description.—Dark brown, extensively variegated with dull yellow; first antennal segment and rostrum pale; apex of scutellum, veins and basal expansion, except margin, and more or less of disc of corium, yellowish (these markings rarely indistinct); pronotum usually uniform brown, sometimes

translucent anteriorly on expanded margins and yellowish along narrow postero-lateral margins; posterior margins of connexival segments and broad inner margins of genital lobes yellowish; legs pale, the tibiae and femora sometimes with broad brown band at middle; ventral surface of abdomen brown, variably, and as a rule conspicuously, diversified with pale spots, especially on genital segments

Head as long as broad, longer than pronotum (29 to 26); tylus narrow, compressed, slightly enlarged toward base; impressions of vertex deep, parallel, rather short, connected posteriorly; preocular tubercles distinct, obtuse; antenniferous spines stout, divergent, without lateral tooth; post-ocular tubercles low, rounded; antennae (fig. 13c) as long as head and pronotum together, the first segment extending beyond middle of tylus, the second as long as distance between eyes; rostrum reaching to or a little beyond middle of prosternum. Pronotum (fig. 13d) of characteristic form, lateral margins thickened, entire except for minute granulation, distinctly and broadly reflexed; carinae well elevated. Scutellum longer than pronotum (35 to 26), narrowly triangular, sides straight, convergent from base, moderately elevated; basal carina transverse, rounded, higher than sides beyond middle. Hemelytra (σ^7) parallel beyond middle, reaching middle of genital lobes; (ρ) more or less narrowed, reaching base or middle of genital lobes; corium extending to middle or apex of fourth segment; exocorium strongly expanded, mesocorium and endocorium each with two or three distinct transverse veins. Abdomen oval, narrower in the male, margins almost entire.

σ (fig. 13b). Fifth ventral segment shorter than sixth (11-14); genital segment short, very convex, the lobes long. Length, 6 mm.

ρ (fig. 13a). Posterior margin of dorsal genital segment straight, slightly notched at middle. Length. 6.5-6.7 mm.

Type specimens (Muskoka, Ontario; Pennsylvania) in Bergroth's and Montandon's collections.

This fine species, easily recognized by pronotal and genital structure, has sometimes been considered as *ornatus* Say, according to Bergroth (1892), and Heidemann did not distinguish it from the western *apicalis*, recently described by Van Duzee. The western localities cited by Van Duzee¹¹ are based on a statement by Heidemann,¹² " . . . it is recorded from . . . California, and Colorado." I do not know the basis for this statement, but am strongly of the opinion that it rests upon the confusion mentioned above and is therefore erroneous. At any rate Heidemann's series of *duzei* contains specimens of *apicalis*, and the California collectors have so far failed to find the former in their territory.

¹¹ Catal. Hemip., p. 130, 1917.

¹² Proc. Ent. Soc. Wash., XII, p. 47, 1910.

14. *Aradus (Aradus) implanus* sp. nov. (Plate II, fig 14)

Description.—Brown; second antennal segment sometimes faintly yellowish at apex; pronotum with two translucent yellowish areas anteriorly on expanded margins; corium with extensive yellowish markings; extreme apex of scutellum yellow; posterior margins of connexival segments with dull reddish yellow bands, the inner margins of genital lobes yellow; legs brown, femora with basal and subapical pale rings, tibiae pale at base and apex; ventral surface of abdomen reddish brown with yellowish markings.

Head as long as broad, longer than pronotum (30 to 26); tylus rather short and thick, sides parallel; impressions of vertex broad, triangular, inner margins parallel; preocular and postocular tubercles rather low, obtuse; antenniferous spines short and stout, slightly incurved, divergent, without lateral tooth; antennae (fig. 14c) rather stout, about as long as head and pronotum together, the first segment reaching about to middle of tylus, the second slightly longer than distance between eyes; rostrum extending not quite to base of prosternum. Pronotum (fig. 14d) rather strongly convex posteriorly, lateral margins somewhat coarsely granulate but not serrate, distinctly reflexed; carinae strongly elevated. Scutellum longer than pronotum (30 to 26), rather narrowly triangular, the sides very strongly elevated to acute apex, higher than basal elevation, the latter transverse, occupying basal fourth of scutellum. Hemicyclia (♂) nearly parallel beyond middle, extending nearly to apex of genital lobes, (♀) moderately narrowed toward apex, reaching middle of lobes; corium extending to apex of fourth segment, strongly expanded at base, with well developed transverse vein.

♂ (fig. 14b). Fifth ventral segment slightly shorter than sixth; genital segment moderately convex, the lobes long; abdomen broadly oval, widest behind middle, margins entire. Length, 5.8 to 6 mm.

♀ (fig. 14a). Posterior margin of dorsal genital segment almost straight; abdomen oval, margins decidedly crenate. Length, 6.3 mm.

Holotype.—♂; Trenton, Ontario, VI, 18, 1907 (J. D. Evans), in the National Collection at Ottawa.

Allotype.—♀; Montreal Island, IV, 15, 1906 (A. Beaulieu), in my collection.

Paratypes.—Males; Pittsburgh, Pennsylvania, in the Heidemann collection at Cornell University, No. 551.1; Funk's Grove, Illinois, IV, 30, 1884 (C. A. Hart), in the Illinois State Natural History Survey collection; Indiana, in my collection; ♀, Warren Woods, Berrien County, Michigan, VII, 1, 1919 (R. F. Hussey), in Hussey's collection; ♂, Alma College, Michigan, in Drake's collection.

This form is closely related to *duzei*, with which it has been confused in collections; it is to be distinguished by the thicker antennae, pronotal structure and color, and the scutellar characters.

15. *Aradus (Aradus) apicalis* Van Duzee (Plate II, fig. 15.)

1920. *Aradus apicalis* Van Duzee, Proc. California Acad. Sci., (4), ix, p. 331.

Distribution.—CALIFORNIA: Fallen Leaf Lake, Eldorado County, VI, 25, 1915 (E. P. Van Duzee); Millwood, Fresno County; Lake Tahoe, VI, 10, 1891; Sunnyside, VI, 12, 1906 (H. E. Burke).

Description.—Very dark brown; base of hemielytra in large part except lateral margin and clavus, apex of scutellum, narrow posterior margins of connexival segments, and inner margins of genital lobes, yellowish; veins of membrane but slightly marked with white; rostrum and legs pale, the femora and tibiae with a broad, indefinite darker band at middle; ventral surface of abdomen reddish brown on disc.

Head nearly as broad as long, slightly longer than pronotum (30 to 27); tylus slightly enlarged ventrally at middle; impressions of vertex elongate, parallel; preocular tubercles well developed; antenniferous spines very stout, divergent, without lateral tooth; postocular tubercles low, rounded; antennae (fig. 15c) moderately robust, as long as head and pronotum together, the first segment reaching middle of tylus, the second slightly longer than distance between eyes (21 to 19); rostrum scarcely reaching middle of mesosternum. Pronotum (fig. 15d) moderately flat, the lateral margins finely and irregularly granulate, strongly reflexed; carinae very strongly elevated. Scutellum much longer than pronotum (37 to 27), elongate, triangular; sides very strongly elevated; apex narrowly rounded; basal fourth sharply elevated. Hemielytra (♂) extending to base of genital lobes, (♀) just beyond base of dorsal genital segment; narrowed from base to apex exposing disc of abdomen at sides; corium not quite reaching apex of fourth connexival segment; exocorium strongly expanded at base; the mesocorium with one, the endocorium without distinct transverse veins; membrane narrow, its sides parallel, rounded at apex, with few cross-veins. Abdomen oval, somewhat broader in the female, the lateral margins entire.

♂ (fig. 15b). Fifth ventral segment about as long as sixth; genital segment rather short and moderately convex. Length, 5.7 mm.

♀ (fig. 15a). Posterior margin of dorsal genital segment very slightly sinuate. Length, 6.5 mm.

Type specimen (Fallen Leaf Lake, California), No. 679, California Academy of Sciences.

This rare species, described from a single specimen, is most closely related to *duzei*, from which it differs in pronotal and especially genitalic structure. A glance at the genital lobes is sufficient to separate it from allied species. As noted above, Heidemann confused this form with *duzei*.

16. *Aradus (Aradus) curticolis* Bergroth (Plate II, fig. 16.)

1913. *Aradus curticolis* Bergroth, Can. Ent., XLV, p. 2.

Distribution.—NORTH CAROLINA: Southern Pines (A. H. Mance). GEORGIA: Marietta, III, 5, 1911 (J. C. Bradley).

Description.—Black; finely granulate, the surface somewhat shining; third antennal segment yellowish white, except at extreme base; membrane brown; front and middle tibiae paler at middle.

Head as long as broad, much longer than pronotum (28 to 19); tylus short, broad, slightly expanded apically; impressions of vertex broad, shallow, slightly divergent anteriorly; preocular tubercles obsolescent; antenniferous spines slender, slightly divergent, without lateral tooth; postocular tubercles absent; eyes unusually prominent, substylated, directed a little upward; antennae (fig. 16c) moderately slender, as long as head and pronotum together, the first segment extending beyond middle of tylus, the second in length equal to width of head including one eye; rostrum reaching base of prosternum. Pronotum (fig. 16d) rather flat, the lateral margins entire, slightly reflexed; carinae moderately elevated. Scutellum (fig. 16d) much longer than pronotum (28 to 19), disc with slight rounded elevation extending from near base to middle, sides very slightly raised.

Macropterous form, ♂ (sec. Bergroth).—Hemelytra reaching apical lobes of abdomen, roundly dilated and reflected near base, exocorium and endocorium with some transverse ridges, mesocorium with a single oblique transverse ridge behind the middle. Abdomen three times broader than the membrane, apical angles of fifth segment very slightly obtusely prominent, male genital lobes obliquely slightly rounded at apex, meeting interiorly. Length, 5.8 mm.

Brachypterous form, ♀. Pronotum very flat posteriorly. Hemelytra (fig. 16d) extending well beyond apex of scutellum, almost to middle of third abdominal segment, veins distinct, membrane much reduced. Abdomen almost circular, broader than long behind scutellum (75 to 68). Genital structure (fig. 16a) very characteristic; posterior margin of dorsal genital segment almost straight. Length, 6 mm.

Type specimen (Southern Pines, North Carolina) in De la Torre-Bucno's collection.

This rare species is well distinguished by head structure, antennal coloration, short pronotum, broad abdomen in both sexes, and female genitalic traits. It is one of the few in this group which are polymorphic with respect to wing development.

17. *Aradus (Aradus) depictus* Van Duzee (Plate II, fig. 17.)

1917. *Aradus depictus* Van Duzee, Proc. California Acad. Sci. (4), VII, p. 25.

Distribution.—BRITISH COLUMBIA: North Bend, VI, 6 (H. G. Hubbard); Victoria. OREGON: Portland, V, 22 (H. G. Hubbard). CALIFORNIA: Berkeley, X, 16, 1919 (E. C. Van Dyke); Bryson, Monterey County, IV,

16, 1917 (E. P. Van Duzee); Claremont (Metz); Lagunitas, Marin County, IV, 7, 1907 (E. C. Van Dyke); Niles Canyon, V, 23, 1917 (W. M. Giffard); Oakland, IV, 16, 1911 (E. C. Van Dyke); San Leandro, VIII, 15, 1920 (E. P. Van Duzee); Santa Barbara.

Description.—Light to dark reddish brown, distinctly variegated; third antennal segment bright yellow except at base; head with pale transverse mark at base; expanded margins of pronotum with a pale, hyaline spot anteriorly; basal margin of pronotum, ends of carinae, and two anterior discal tubercles, pale; corium yellowish, with fine, irregular, dark brown markings, extreme apex black; membrane pale brown, with white reticulation; scutellum dark, the raised margins yellow at middle; edge of abdomen narrowly dark brown, posterior margins of connexival segments and inner margins of genital lobes pale, a quadrate black spot in inner anterior corner of connexival segments; second segment of rostrum, coxae, trochanters, subapical ring of femora, and basal and apical rings of tibiae, yellowish; ventral surface conspicuously variegated.

Head as long as broad, longer than pronotum (27 to 21); tylus rather short, sides parallel; impressions of vertex rather broad, distinct, slightly divergent; preocular tubercles very well developed, acute; antenniferous spines slender, divergent, with a very distinct lateral tooth which varies from obtuse to acute; postocular tubercles low, rounded; antennae (fig. 17c) comparatively slender, about as long as head and pronotum together, the first segment reaching a little beyond middle of tylus, the second as long as distance between eyes; rostrum extending a little beyond base of prosternum. Pronotum (fig. 17d) moderately convex posteriorly, the lateral margins widely expanded and serrate; carinae narrow, sharply elevated, the median with a conspicuous granule before the middle. Scutellum much longer than pronotum (34 to 21), nearly triangular but with sides parallel just at base, then almost straight to acute apex, very strongly and sharply raised; disc nearly flat, with a low, transverse carina at base. Hemelytra (♂) extending to genital lobes, (♀) over base of dorsal genital segment; connexivum entirely exposed at middle; corium reaching to or beyond middle of fourth segment; exocorium moderately expanded at base, mesocorium with one, endocorium without distinct transverse veins. Abdomen ovate, a little more narrowed anteriorly in the male; margins minutely notched.

♂ (fig. 17b). Fifth ventral segment about as long as sixth; genital segment short, carinate, but slightly convex. Length, 5 to 5.5 mm.

♀ (fig. 17a). Posterior margin of dorsal genital segment shallowly emarginate at middle. Length, 6 to 6.5 mm.

Type specimens (Niles Canyon and Claremont, California), No. 329, California Academy of Sciences and in Van Duzee's collection.

This is one of the most brightly marked of the American species and is well distinguished in most respects, not being closely

related to any other. It may be placed here, near the end of the *ornatus* group, as transitional in antennal structure. Van Duzee¹ notes certain differences in coloration and in antennal and pronotal structure exhibited by the two specimens originally described, and treats them as sexual characteristics, but study of a long series received from Dr. H. H. Knight indicates that these differences are not sexual but due rather to individual variation, which, in this species, is unusually great. During the past summer Van Duzee has found *depictus* again at San Leandro, near Oakland, California, and he sends me the following notes on its habits: "As found here this species seems to occur only under the loose bark of live oak stumps and logs and the dry summer season seems to be both the time of aestivation and of development from larval to adult condition. All found were hiding in depressions or crevices of the bark. Apparently they mature and then lie almost dormant until the fall rains."

18. *Aradus (Aradus) concinnus* Bergroth (Plate II, fig. 18.)

1892. *Aradus concinnus* Bergroth, Proc. Ent. Soc. Washington, II, p. 337.

1906. *Aradus concinnus* Bergroth, Can. Ent., XXXVIII, p. 198 (*Piestosoma*).

Distribution.—CALIFORNIA: Los Angeles County (D. W. Coquillett); Palm Springs, II, 10, 1897 (H. G. Hubbard); "Southern California" (Morrison).

Description.—Brown, variegated with pale, reddish, and dark brown markings; spines and tubercles of head, first antennal segment, submedian and apical rings of second, and apical three-fourths of third, yellowish, fourth dark brown; expanded margins of pronotum with a large, ovate, yellowish translucent spot anteriorly; scutellum brown, the disc reddish yellow toward apex, the margins yellow at middle then narrowly black to apex; corium yellowish white, dark brown at apex and variably so along principal veins and between some of the transverse veins; membrane white, with more or less extensive brown maculation; connexivum reddish, each segment with a dark spot at inner basal angle and a narrow dark line along lateral margin which does not quite reach apex; inner margin of genital lobes pale; legs yellowish, femora biannulate with brown, tibiae annulate before apex; ventral surface of thorax dark brown, of abdomen pale with dark mottling.

Head slightly longer than broad (25 to 24), longer than pronotum (25 to 20); tylus of moderate length, strongly compressed; impressions of vertex deep, divergent anteriorly, whole vertex sunken; preocular tubercles very large, acute; postocular moderately developed; an extra tubercle between

¹ Proc. Cal. Acad. Sci., (4), VII, p. 254, 1917.

preocular and postocular; antenniferous spines strong, acute, divergent, with distinct lateral tooth; antennae (fig. 18c) moderately stout, about as long as head and pronotum together, the first segment reaching scarcely to middle of tylus, the second equal in length to distance between eyes; rostrum extending over apical one-third of mesosternum, sometimes to middle. Pronotum (fig. 18d) moderately convex posteriorly, lateral margins strongly expanded, slightly reflexed, the explanate portion not reaching anterior angles; carinae coarsely granular, strongly elevated posteriorly. Scutellum longer than pronotum (29 to 20), broad, sides nearly parallel to middle, then straight to acute apex, strongly and sharply elevated, disc flat, transversely elevated at base. Hemelytra (σ) extending to genital lobes, rather strongly narrowed posteriorly, exposing disc of abdomen at sides, corium almost to apex of fourth; (φ) reaching about to middle of dorsal genital segment, similarly narrowed, corium to middle of fourth; basal expansion of exocorium moderate, evenly rounded, denticulate, slightly reflexed; mesocorium with one, endocorium without distinct transverse veins.

σ (fig. 18b). Fifth ventral segment slightly shorter than sixth; genital segment short, moderately convex; abdomen ovate, broadest behind middle, margins entire. Length, 4 to 5 mm.

φ (fig. 18a). Posterior margin of dorsal genital segment usually broadly rounded, sometimes nearly straight, or slightly emarginate at middle; abdomen very broad, almost circular, lateral margins entire. Length, 5 to 6 mm.

Type specimen (South California) in Stockholm Museum.

Since Hubbard found this species in large numbers at Palm Springs, California, it has very seldom been taken. It is closely related to *depictus*, from which it is readily distinguished by the shape of the scutellum; it differs from all others in the coloration of the antennae. Bergroth¹⁴, in describing the female, places the species in Laporte's group *Piestosoma*, which is typified by the European *depressus* Fabricius, because of the presence of an angulated carina which the fifth ventral segment is said to bear. This carina is a very striking feature in *depressus*, but in *concinus* it is no more strongly developed than in *fuscumaculatus*, *duzei*, *apicalis*, or *depictus*, and is, in fact, scarcely noticeable. The anteriorly lobed pronotal margins, genital peculiarities, and short second antennal segment of *depressus* are not seen in *concinus* and hence I do not think that the two can be placed in the same group. If this view is correct the subgenus *Piestosoma* of Van Duzee's Catalogue¹⁵ is to be removed from our list.

¹⁴ Canad. Entom., xxxviii, p. 198, 1906.

¹⁵ Cat. Hemip., p. 135, 1917.

19. *Aradus (Aradus) proboscideus* Walker (Plate II, fig. 19.)

1873. *Aradus proboscideus* Walker, Cat. Hem.-Het. Brit. Mus., vii, p. 35.
 1903. *Aradus luteolus* Fyles, Can. Ent., xxxv, p. 75.
 1904. *Aradus hubbardi* Heidemann, Proc. Ent. Soc. Washington, vi, p. 232.
 1920. *Aradus taylora* Van Duzee, Proc. California Acad. Sci., (4), ix, p. 335.

Distribution.—NOVA SCOTIA: Boisdale, Cape Breton. NEW BRUNSWICK: Miscou Harbor, VI, 16, 1914 (C. H. Young). ONTARIO: Brantford, VII, 24, 1913 (C. A. G.); Hybla, V, 17, 1909 (H. Dawson); St. Martin's Falls. MAINE: Mount Katahdin, 4300 to 5000 ft., VIII, 19, 1902 (H. G. Barber); Orono, VI, 4, 1913 (H. M. Parshley). NEW HAMPSHIRE: Mount Washington (A. T. Slosson). MASSACHUSETTS. NEW YORK: Cranberry Lake, VII, 7, 1917 (C. J. Drake); Saranac Lake, IX. MANITOBA: Winnipeg Beach, VIII, 27, 1910 (J. B. Wallis). WYOMING: National Park, VIII, 10 (H. G. Hubbard). IDAHO: Moscow Mountain, X, 29, 1910 (J. A. Hyslop). MONTANA: Kalispell, VI, 13, to 20 (H. F. Wickham); Lo Lo. ALASKA: Ketchikan, IV, 15, 1916 (J. A. Kusche); Saldovia, VII, 21, 1899 (T. Kincaid). BRITISH COLUMBIA: Ainsworth, VII, 11, 1903 (A. N. Caudell); Bear Lake, 7000 ft., VII, 28 (R. P. Currie); Fry Creek, VII, 23, 1903 (A. N. Caudell); Glacier, X, 6 (E. A. Schwarz); Kaslo, VI, 1 (H. G. Dyar); Malahat, V, 29, 1917 (R. C. Treherne); Revelstoke, VII, 8 to 13, 1905 (J. C. Bradley); Terrace, VI to IX (Mrs. W. W. Hippiusley); Vancouver Island, VI, 4, 1898 (G. W. Taylor). WASHINGTON: Olympia (T. Kincaid). OREGON: Astoria, V, 25, 1902 (E. A. Schwarz); Portland, V, 22. CALIFORNIA: Blue Lake, Humboldt County, VI, 20 to 27, 1907 (J. C. Bradley); Fallen Leaf Lake, Eldorado County, VII, 19, 1915 (E. C. Van Dyke); Huntington Lake, Fresno County, 7000 ft., VII, 12, 1919 (E. P. Van Duzee); Santa Cruz Mountains; Sierra Nevada, summit; Siskiyou County; Tallac; Lake Tahoe, VII, 11, 1915 (C. W. Woodworth); Truckee, 5800 ft., VIII; Tuolumne Meadows, 9000 ft., VIII, 1, 1916 (C. Dury). NEVADA. UTAH: Alta, VII, 1 (Hubbard & Schwarz); Uinta National Forest, 8000 ft., VII, 8, 1917 (J. Silver). COLORADO: Argentine Road (H. F. Wickham); Custer County (Cockerell); Garland, V, 6, 1906; Georgetown, VII, 29, 1909, 10,000 to 12,000 ft. (W. J. Gerhard); Ouray (Hoff). ARIZONA: Williams, V, 30 (Barber & Schwarz). NEW MEXICO: Cloudcroft, VI, 18, 1902; Fort Wingate, VII; Las Vegas Hot Springs, VI, 5 (Barber & Schwarz).

Description.—Moderately dark to light cinnamon brown with paler markings of variable extent and distinctness; rarely almost black; apices of second and third antennal segments (sometimes half the latter) and preocular spines of head usually pale; posterior margin and lobes of pronotum more or less broadly pale; apex of scutellum usually pale; corium pale, with more or less of apical portion dark; membrane whitish hyaline to dark brown, sometimes maculated; posterior margins of connexival segments pale, at least at apical angles, the lateral margins often narrowly dark; inner margins of genital lobes pale; rostrum brown, darker toward apex; legs brown, coxae and apices of femora and tibiae pale; ventral surface of abdomen reddish brown, variably mottled and spotted.

Head longer than broad (36 to 32), much longer than pronotum (36 to 25); tylus large, the sides parallel; impressions of vertex narrow, deep, lunate, and widely separated; preocular tubercles distinct, moderately acute; antenniferous spines slender, acute, variably divergent, with small or obsolescent lateral tooth; postocular tubercles prominent, acute; antennae (fig. 19c) slender, cylindrical, almost as long as head and pronotum together; the first segment reaching not quite to middle of tylus, the second in length equal to width of head including one eye; rostrum extending almost or quite to middle of mesosternum. Pronotum (fig. 19d) rather flat, the margins little reflexed, with coarse teeth anteriorly and fine denticulation posteriorly; carinae well elevated, the lateral pair unusually long. Scutellum longer than pronotum (36 to 25), at least as long as head, sides slightly curved or moderately sinuate, moderately elevated; apex acute or narrowly rounded; disc with low rounded elevation before middle. Hemelytra (σ') extending to genital lobes, moderately narrowed, exposing connexivum, corium about to middle of fourth segment; (\varnothing) extending almost or quite to dorsal genital segment, strongly narrowed, width at apex of corium equal to one-half width of abdomen, exposing a good deal of abdominal disc at sides, corium to or beyond apex of third; exocorium moderately expanded at base, evenly rounded, slightly reflexed; entire corium with numerous variable transverse veins; membrane narrowly rounded at apex; abdominal margin with small notches.

Brachypterous form.—Pronotum very little modified, narrower but just as long, sides nearly straight, oblique, width greatest a little farther posteriorly. Hemelytra extending to apex of second abdominal segment at middle; corium normally broad at base, much reduced apically, the veins distinct; membrane very short, not extending beyond apex of corium (\varnothing , Bergroth's collection)

σ' (fig. 19b). Fifth ventral segment slightly shorter than sixth; genital segment short, strongly convex, the lobes short; abdomen broadly oval, rounded posteriorly. Length, 6 to 6.9 mm.

\varnothing (fig. 19a). Length of dorsal genital segment more than one-half breadth (18 to 30); anterior margin almost or quite evenly curved, semicircular; posterior margin curved, truncate at middle; abdomen large, oval, rather pointed posteriorly, much less than one-half broader than pronotum (80 to 60). Length, 7 to 9.7 mm.

Type specimen, \varnothing , (St. Martin's Falls, Albany River, Hudson's Bay) in the British Museum.

This species, as understood here, is one of the most variable both in color and in details of structure; it is to be recognized by the antennal and genitalic structure, and by the pronotal characteristics, *i. e.*, the flat surface, and the oblique, usually straight, antero-lateral margins, with coarse teeth. In all but the darkest forms the pale areas situated posteriorly on the pronotum

and the vittae of the connexivum are characteristic. In the type series of Heidemann's *hubbardi* we find a good example of this unusual variability; the male type specimen has the scutellum acute and concolorous at apex, the sides slightly arcuate, while in the female the apex is narrowly rounded and pale, the sides sinuate. These differences are not sexual, and numerous intergrading conditions are to be met with in a series of specimens. As often happens in the case of variable species, a number of observers have described *proboscideus* under various names, resulting in the synonymy given above, although the variability is not great enough to have caused the confusion, had Walker's work been understood by American students. Van Duzee's *taylori*¹⁶ is founded on an example of the dark form common in British Columbia, which I do not consider worthy of a varietal name; the unfortunate comparison with *acutus*, instituted in connection with the original description, may account for the author's failure to realize the true relationships of *taylori*. Mr. G. A. Moore, of Quebec, has been kind enough to make a special visit to the Rev. Mr. Fyles for the purpose of studying the type of *luteolus*. Provided with specimens and a copy of my description he made an extremely careful examination and reported as follows: "I have no hesitancy in saying that it (Fyles' type) agrees with both specimen and description"; and he added extended notes on the detailed characters, bearing out the truth of this assertion. Through the kind offices of Mr. G. C. Champion I have received a full description and drawings of the type specimen of *proboscideus* Walker, prepared with the greatest attention to detail by Mr. K. G. Blair, of the British Museum (and an artist). From this information it was quite evident to me that Heidemann had described the same species under the name *hubbardi*, and upon my sending a typical example of the latter with my description, Mr. Blair wrote: "On comparison I think there can be no doubt that *A. proboscideus* Walk. and *A. hubbardi* Heid. are identical." Careful notes were added in this case also, and at the bottom of the sheet bearing my description, "In my opinion the two are certainly synonymous." Walker's original description is quite inadequate, and misstates the sex of the type; while that of Fyles, as might be expected of a lepidopterist,

¹⁶ Proc. Cal. Acad. Sci., (4), ix, p. 335, 1920.

is excellent in the matter of color but totally lacking in statements regarding the important structural features.

20. *Aradus* (*Aradus*) *basalis* sp. nov. (Plate II, fig. 20.)

Description.—Grayish brown; antennae darker toward apex, first segment and apices of second and third narrowly pale; corium almost entirely dull yellowish, except apical third, clavus pale at base; membrane light brown with darker shadings, a pale spot just behind scutellum; posterior margins of connexival segments narrowly dull yellowish; inner margins of genital lobes rather broadly pale; rostrum darker toward apex; legs light brown, the tibiae pale at apex; ventral surface rather dark brown, with indefinite paler areas.

Structure similar to that of the preceding, except as follows: Head more finely and evenly granulate; impressions of vertex a little longer, less curved and less widely separated; antenniferous spines slightly divergent, the lateral tooth obsolescent; postocular tubercles prominent, rounded; antennae (fig. 20c) slightly longer than head and pronotum together (69 to 65), the first segment extending beyond middle of tylus, the second as long as or longer than width of head including both eyes; rostrum extending but slightly beyond base of prosternum. Pronotum (fig. 20d) very flat, lateral margins very little reflexed, curved, with fine irregular denticulation; lateral carinae moderately long. Scutellum longer than pronotum (35 to 27), shorter than head (35 to 37), broadly triangular, the sides nearly straight, parallel only at extreme base, moderately elevated; discal elevation very slight; apex narrowly rounded. Hemelytra similar, but in the female of variable length, extending over basal one-third of fifth segment, or nearly to apex of sixth.

♂ (fig. 20b). Fifth ventral segment about as long as sixth; genital segment short, strongly convex, lobes moderate in length; abdomen comparatively broadly oval, widest behind middle. Length, 7 to 7.3 mm.

♀ (fig. 20a). Anterior margin of dorsal genital segment nearly or quite straight at middle, rather angulate laterally; posterior margin distinctly curved, truncate at middle; lobes shorter, as viewed from above, than in preceding; abdomen broadly oval, more than one-half broader than pronotum (95-60). Length, 8 to 8.3 mm.

Holotype.—♀; Temple, New Hampshire, 1900 feet, V, 26, 1900 (F. Blanchard), No. 12034, Museum of Comparative Zoology, Cambridge.

Allotype.—♂, Mount Katahdin, Maine, VIII, 9, 1902 (H. G. Barber), in my collection.

Paratypes.—♂, data of allotype, in Barber's collection; two females, data of holotype, in Academy of Natural Sciences of Philadelphia, and in my collection; ♀, Mount Washington, New Hampshire (Mrs. A. T. Slosson), in Mrs. Slosson's collection;

♀, Holden, Maine, VI, 20, 1902 (F. A. Eddy), in my collection; ♀, Maine (H. T. Fernald), in the Uhler collection, United States National Museum, No. 24073; ♂, Saranac Lake, New York, IX (W. T. Davis), in Davis' collection.

This species is most closely related to *proboscideus*, from which it may be distinguished by the broader form, smaller female genital lobes, as viewed from above, longer second antennal segment, etc., as detailed in the table of species. Type specimens have been compared with types of *proboscideus* Walker and *luteolus* Fyles by Messrs. Blair and Moore respectively, and pronounced distinct.

21. *Aradus (Aradus) furvus* sp. nov. (Plate III, fig. 21.)

Description.—Dark brown, with pale markings variable in extent and intensity; extreme apices of second and third antennal segments pale; pronotum more or less yellowish postero-laterally; basal expansions and veins of corium variably pale; membrane smoky brown, basal spot and veins white; connexivum vaguely marked with dark and light spots, but without distinct vittae; inner margins of genital lobes very narrowly pale; legs, rostrum, and ventral surface nearly uniform brown.

Structure as in *proboscideus*, except as follows: Head a little longer than pronotum (32 to 28); tylus slightly bulbous; antenniferous spines very small and slender, shorter than the tubercles which bear them, slightly divergent, with small but distinct lateral tooth; antennae (fig. 21c) of slightly different shape, the second segment as long as width of head including both eyes; rostrum extending to apex of mesosternum. Pronotum (fig. 21d) with lateral margins reflexed; carinae feebly developed. Scutellum very large, triangular, width equal to three-fourths length, much longer than head (40 to 32) or pronotum; sides very slightly arcuate, slightly and evenly elevated; apex narrowly rounded; disc with very low elevation before middle. Hemelytra (♂) extending over base of genital lobes, corium to middle of fourth segment; (♀) nearly to dorsal genital segment, more than one-half width of abdomen at apex of corium, nearly covering abdominal disc; membrane broadly rounded at apex.

♂ (fig. 21b). Fifth ventral segment distinctly longer than sixth; genital segment small, strongly convex, lobes long; abdomen oval, the marginal notches small. Length, 7.5 mm.

♀ (fig. 21e). Dorsal genital segment almost twice as broad as long (30 to 16), anterior margin sinuate; lobes rounded posteriorly; abdomen evenly oval, one-half broader than pronotum (90 to 60); lateral margins almost entire. Length, 8.5 mm.

Holotype.—♂; Williams, Arizona, V, 30 (Barber and Schwarz), United States National Museum, No. 24074.

Allotype.—♀; same data, in my collection.

This species is readily distinguished from the darker forms of *proboscideus* and from *basalis* by the larger scutellum, and genitalic characters, especially the shape of the dorsal genital segment. The ventral valves in the allotype are opened, so that it is impossible to present a drawing of these parts, but there seem to be no strong peculiarities in their structure.

22. *Aradus (Aradus) consors* sp. nov. (Plate III, fig. 22.)

Description.—Grayish brown, with slight and obscure darker markings; antennae light reddish brown, second and third segments pale at apex, fourth darker; pronotum slightly paler across base; posterior margins of connexival segments and inner margins of genital lobes very obscurely pale; membrane light brown; ventral surface reddish brown.

Structure as in *proboscideus* except as follows: Antenniferous spines shorter, conical, slightly divergent; postocular tubercles prominent, rounded. Pronotum (fig. 22d) with disc more depressed anteriorly; lateral margins with teeth smaller and broader anteriorly; carinae very feebly elevated; posterior margin perfectly straight at middle. Scutellum broader, the sides nearly straight, feebly elevated, especially at base; apex broadly rounded. Hemelytra (♀) broad, not exposing disc of abdomen at sides, extending to middle of dorsal genital segment, corium over base of fourth; basal expansion of corium long, slightly reflexed; mesocorium with one, endocorium without distinct transverse veins; membrane broadly rounded at apex. Abdominal margin strongly crenate.

♂. Unknown.

♀ (fig. 22e). Posterior margin of dorsal genital segment almost evenly arcuate; lobes prominent, rounded; abdomen evenly oval, narrow, one-fourth wider than pronotum (75 to 60). Length, 7.6 mm.

Holotype.—♀; Massachusetts (S. Henshaw), Museum of Comparative Zoology, No. 12033.

This species is related to *proboscideus*, having the same head and antennal structure, but is readily distinguished by color, pronotal structure, longer hemelytra, crenate abdomen, and more prominent genital lobes. The genital plates seem to be similar in form to those of allied species and, being opened, cannot be drawn in a position suitable for comparison.

23. *Aradus (Aradus) persimilis* Van Duzee (Plate III, fig. 23.)

1916. *Aradus persimilis* Van Duzee, Univ of Calif. Pubs., Tech. Bulls., I, p. 232.

Distribution.—BRITISH COLUMBIA: Terrace, VI to IX (Mrs. W. W. Hippisley). WASHINGTON: Olympia; Paradise Park, Mount Rainier, 6000 ft., VII, 15 to 31, 1905 (E. C. Van Dyke). MONTANA: Anaconda, VIII, 24,

1908. COLORADO. CALIFORNIA: Glen Alpine Creek, Fallen Leaf Lake, Eldorado County, VI, 30, 1915 (E. C. Van Dyke); Felton, Santa Cruz Mountains, V, 20, 1907 (J. C. Bradley); Sierra Nevada, summit; Soda Springs, VIII, 8, 1906 (H. E. Burke).

Description—Cinnamon brown, with extensive paler and darker areas; antennae darker toward apex; pronotum dark on anterior lobe except carinae; postero-lateral areas more or less broadly pale, as a rule; basal expansion of corium and sometimes the veins, apex of scutellum and usually margins toward base, posterior angles of connexival segments and sometimes their posterior margins, and inner margins of genital lobes, pale yellowish; membrane more or less distinctly maculated, the veins white; legs and ventral surface rather dark, with variable indefinite pale areas.

Structure similar to that of *proboscideus*, except as follows: Head but slightly longer than pronotum (32 to 29); antennae (fig. 23c) as long as head and pronotum together, length of the second segment almost equal to head width including both eyes, rather more distinctly enlarged at apex; rostrum extending beyond middle of mesosternum. Pronotum (fig. 23d) longer, the antero-lateral margins less strongly oblique and with coarser and more irregular teeth; disc anteriorly very strongly convex, with a narrow depression between median carinae; intermediate carinae extending a little farther forward, the lateral pair shorter. Scutellum obovate, broadly rounded at apex, sides generally distinctly sinuate. Basal expansions of corium elongate, not evenly rounded, strongly reflexed.

♂ (fig. 23b). Fifth ventral segment distinctly shorter than sixth (10 to 13); genital segment moderately convex, very short, the lobes short, with rounded apical margins; abdomen broadly oval, sides rather strongly crenate. Length, 6.4 to 6.6 mm.

♀ (fig. 23a). Dorsal genital segment one-half as long as broad; anterior margin less than a semicircle; posterior margin slightly curved, truncate at middle; abdomen narrowly oval, pointed posteriorly, the margins almost entire. Length, 7.3 to 7.5 mm.

Type specimens (Glen Alpine Creek, Fallen Leaf Lake, California) in California Academy of Sciences and Van Duzee's collections.

This form is distinguished by the non-annulate antennae, anteriorly elevated pronotum, and the male and female genitalic traits. With the three preceding species it is best described by comparison with *proboscideus*, to avoid the repetition of identical statements; the five are closely related but sufficiently distinct species and can be recognized without difficulty by the criteria employed in the table of species.

24. *Aradus (Aradus) medioximus* sp. nov. (Plate III, fig. 24.)

Description.—Pale reddish or cinnamon brown, with some darker shadings on pronotal disc, scutellum, and veins of corium; antennae darker toward apex, the second and third segments narrowly pale at tip; apical angles of connexival segments obscurely pale, lateral margin with an obscure dark line; disc of abdomen pale reddish; ventral surface pale reddish brown, thoracic sterna darker; legs reddish, pale at joints.

Head as long as broad, equal in length to pronotum; tylus rather large, thick, the sides parallel; vertex elevated, coarsely granulated; impressions of vertex narrow, widely separated, slightly divergent anteriorly, connected posteriorly; preocular tubercles large; antenniferous spines rather small, moderately divergent, the lateral tooth very distinct; antennae (fig. 24c) slender, cylindrical, shorter than head and pronotum together (62 to 72), the first segment extending not quite to middle of tylus, length of second equal to width of head including one eye; rostrum extending somewhat beyond middle of mesosternum. Pronotum (fig. 24d) strongly biconvex, the anterior lobe well elevated, the transverse depression sharply marked; sides moderately expanded and reflexed, very coarsely toothed, laminate to anterior angles; carinae distinctly raised, the intermediate pair very thick and coarsely granulate. Scutellum slightly longer than pronotum, sides slightly elevated, parallel in basal one-third, then slightly concavely arcuate to rounded apex; disc depressed, with slight central elevation. Hemelytra (♀) extending nearly to apex of dorsal genital segment, strongly narrowed exposing disc of abdomen at sides, corium reaching nearly to apex of fourth segment; basal expansion of exocorium moderate, elongate; mesocorium with one, endocorium without transverse veins.

♂. Unknown.

♀ (fig. 24a). Dorsal genital segment very large, twice as broad as long; posterior margin straight, transverse; lobes as viewed from above short, broad, contiguous inwardly; abdomen broadly and evenly oval, the margins entire. Length, 8.6 mm.

Holotype.—♀; California, in my collection.

Paratypes.—♀; Vancouver Island, British Columbia, V, 21, 1897 (G. W. Taylor), in Van Duzee's collection; ♀, [unknown locality], V, 13, 1897, in H. Osborn's collection.

This species is related to *persimilis* and *vadosus*, being in some respects intermediate. From the former it is distinguished by the structure of the pronotum and of the genital lobes and from the latter by antennal and abdominal characters, etc.

25. *Aradus (Aradus) vadosus* Van Duzee (Plate III, fig. 25.)

1920. *Aradus vadosus* Van Duzee, Proc. California Acad. Sci., (4), ix, p. 334.

Distribution.—BRITISH COLUMBIA: Vancouver Island, IX, 6, 1899 (G. W. Taylor). MONTANA: Lo Lo, V, 15, 1914.

Description.—Grayish yellow, variegated with brown and tinged with red on scutellum, pronotum posteriorly, and disc of abdomen; antennae darker in apical half, the second and third segments narrowly pale at apex, the second broadly and indefinitely pale at middle; pronotum except explanate margins sometimes almost black; connexivum with a dark marginal spot at base of each segment; tergum with a series of dark spots, each shared by adjacent segments and situated mostly within connexival suture: disc of sixth abdominal and dorsal genital segments dark, the latter with a narrow, median, pale stripe; genital lobes with narrow dark margin in lateral half; hemielytra dark brown, veins of corium paler; legs yellowish with irregular dark spots, tibiae pale at apex.

Head longer than broad (40 to 34), longer than pronotum (40 to 30); tylus large, slightly bulbous; impressions of vertex narrow, parallel, close to eyes, between them two rows of pale granules diverging anteriorly; preocular tubercles very distinct; antenniferous spines slender, divergent, with distinct lateral tooth, suddenly broader at base; antennae (fig. 25c) slender, almost as long as head and pronotum together, the first segment not reaching middle of tylus, the second in length more than equal to width of head including both eyes (36 to 31); rostrum extending slightly beyond middle of mesosternum. Pronotum (fig. 25d) distinctly convex before and behind transverse depression; lateral margins slightly reflexed, strongly expanded to anterior angles, with large teeth; carinae well elevated. Scutellum longer than pronotum (40 to 30), sides slightly curved from base to rounded apex and a little elevated; basal portion of disc somewhat elevated and bearing three longitudinal carinae. Hemielytra (♂) reaching genital lobes, corium to apex of fourth at connexival suture; (♀) extending to middle of sixth abdominal segment, the corium to middle of fourth; connexivum broadly exposed; exocorium moderately expanded, the dilation elongate; mesocorium with one, endocorium without distinctly developed transverse veins.

♂ (fig. 25b). Sixth ventral segment longer than fifth, angulately emarginate posteriorly; genital segment short, strongly convex, the lobes rather short; abdomen oval, margins crenate at sutures. Length, 8.7 mm.

♀ (fig. 25a). Dorsal genital segment truncate at apex; abdomen elongate oval, margins slightly crenate at sutures. Length, 9.75 mm.

Type specimen (Vancouver Island, British Columbia) in Van Duzee's collection.

This is a rather brightly marked species, related to *debilis*, from which it is to be distinguished by the color of the antennae, shape of pronotum, and genitalic structure.

26. *Aradus (Aradus) debilis* Uhler (Plate III, fig. 26.)

1876. *Aradus debilis* Uhler, Bull. U. S. Geol. Geog. Surv., 1, p. 322.

Distribution.—BRITISH COLUMBIA: Mount McLean, VI, 19, 1917 (M. H. Ruhmann); North Bend, VI, 7; Revelstoke; Saanich District, Vancouver Island, VIII, 6, 1918 (W. Downes); Yale. WASHINGTON: Pullman, VII, 20,

1898 (C. V. Piper); Seattle. IDAHO: Moscow (R. A. Cooley). MONTANA: Kalispell, VI, 13 to 20 (H. F. Wickham). [COLORADO] CALIFORNIA: Fallen Leaf Lake, Eldorado County, VII, 17, 1915 (E. C. Van Dyke); Huntington Lake, Fresno County, 7000 ft., VII, 12, 1919 (Mrs. E. P. VanDuzee); Lake Tahoe, VI, 10, 1891; Meyers, VII, 5; Monterey; Shasta County, V, 6, 1913 (F. W. Nunnenmacher); Sierra Nevada; Truckee, 5800 ft., VIII (H. F. Wickham). ?MASSACHUSETTS: Woburn, IV, 27, 1907 (G. E. Morris).

Description.—Pale brown, with more or less reddish tinge; third antennal segment yellowish white except at base, fourth and apex of second dark; disc of pronotum, scutellum, and corium between veins variably darkened, the basal expansion of corium pale; membrane dark, more or less distinctly maculated; connexivum finely mottled, the segments dark at base; rostrum reddish brown, darker toward apex; legs reddish brown, with fine dark spots and sparse pale granules, the tibiae pale at apex and sometimes at middle; ventral surface reddish brown, finely mottled.

Head longer than broad (40 to 34), almost as long as pronotum; tylus long, moderately bulbous; impressions of vertex deep, slightly curved, widely separated, convergent posteriorly; preocular tubercles large, acute, spinose; antenniferous spines rather short, slender, slightly divergent, with distinct lateral tooth; postocular tubercles prominent, acute; antennae (fig. 26c) very slender, almost as long as head and pronotum together (85 to 88), the first segment not reaching middle of tylus, the second longer than head (49 to 43); rostrum very long, extending to or somewhat beyond anterior margin of metasternum. Pronotum (fig. 26d) with lateral margins broadly explanate, the teeth large and variable; disc strongly elevated, the transverse depression well marked; carinae distinctly elevated, the intermediate pair tuberculate anteriorly on summit of anterior discal elevation; on the posterior slope of the latter is a transverse, granulated ridge, interrupted at middle and curved forward laterally. Scutellum shorter than pronotum (40 to 45), pentagonal, the sides roundedly angulate; apex broadly rounded; discal elevation angulate, highest posteriorly, continued halfway to apex in a sharply sloping carina; sides parallel and distinctly elevated toward base, lower toward apex. Hemelytra (♂) rather broad, covering abdominal disc, reaching genital lobes, corium beyond middle of fourth segment; (♀) exposing a little of abdominal disc at sides, reaching almost or quite to middle of sixth abdominal segment, corium almost or quite to apex of fourth; basal expansion of exocorium moderately elongate; entire corium with numerous rather distinct transverse ridges.

♂ (fig. 26b). Fifth ventral segment slightly longer than sixth; genital segment short, strongly convex; abdomen oval. Length, 9 to 9.7 mm.

♀ (fig. 26a). Dorsal genital segment twice as broad as long, its anterior margin sharply arcuate at sides, straight across middle; posterior margin strongly arcuate as a whole, straight for a short distance at middle; abdomen oval, strongly narrowed and produced posteriorly. Length, 8.4 to 11.4 mm.

Type specimen (Vancouver Island, British Columbia) in the Uhler collection, United States National Museum, No. 24077, lectotype.

This is a large and rare species, distinguishable without difficulty by the color and structure of the antennae, as well as by pronotal and genitalic characters. It is most distinctly a western species and I feel certain that the Massachusetts example, doubtfully recorded above, has been mislabeled. In one of her Mt. Washington lists Mrs. Slosson¹⁸ records *debilis*, but the specimen proves on examination to have been misidentified.

27. *Aradus (Aradus) cincticornis* Bergroth (Plate III, fig. 27.)

1906. *Aradus cincticornis* Bergroth, Can. Ent., xxxviii, p. 198.

Distribution.—ALABAMA (C. F. Baker).

Description.—Blackish brown; second antennal segment with sparse yellow dots, third whitish yellow except in basal third; lateral and basal portions of pronotum yellow, the median carinae posteriorly either black or yellow; apical half of scutellum, sometimes only at sides, pale brown, the extreme apex black; corium, connexivum, and ventral surface mottled with yellow; apical angles and more or less of apical margins of connexival segments yellowish; legs dark, with yellow dots, trochanters and apices of tibiae pale; membrane grayish, vaguely maculated.

Head as long as broad, a little longer than pronotum (25 to 23); tylus rather short, sides parallel; impressions of vertex deep, widely separated, slightly divergent anteriorly, connected posteriorly; vertex with two parallel rows of coarse granules; preocular tubercles distinct, rather acute; eyes prominent, substylated; antenniferous spines very acute, conical, moderately divergent, with distinct lateral tooth; postocular tubercles distinct, acute or obtuse; antennae (fig. 27c) short and slender, not as long as head and pronotum together (40 to 48), the first segment reaching about to middle of tylus, length of second a little less than width of head including one eye (19 to 21); rostrum extending about to middle of mesosternum. Pronotum (fig. 27d) with lateral margins rather broadly explanate but scarcely reflexed, variably crenulate and with a few remote, blunt teeth; disc with a decided transverse elevation anteriorly, on which the intermediate carinae terminate each in a tubercle; carinae well elevated. Scutellum slightly longer than pronotum (26 to 23), broad, sides slightly raised, sinuate, parallel in basal third, straight toward the very broad apex; basal half a little elevated, with a narrow, median, tuberculiform extension. Hemelytra (♂) rather strongly narrowed, exposing disc of abdomen at sides, reaching genital lobes, corium to apex of fourth segment; (♀) similarly narrowed, reaching about to middle of sixth segment, corium about to middle of fourth; basal expansion of exocorium rather narrow; mesocorium with two, endocorium without distinct transverse veins. Abdomen broadly oval; the lateral margins with distinct subangular prominence before apex of each segment.

♂ (fig. 27b). Fifth ventral segment shorter than sixth (10 to 13); genital segment short, strongly convex, the lobes very short. Length, 5.8 to 6 mm.

¹⁸ Ent. News, vi. p. 321, (1895).

♀ (fig. 27a). Dorsal genital segment much wider than long (15 to 10), its posterior margin slightly curved, straight just at middle. Length, 6.5 to 6.7 mm.

Type specimens (Alabama) in Bergroth's collection.

This species is distinct in most of its characters, especially in color, shape of abdomen (broad in both sexes), and genitalic structure, while exhibiting somewhat remote relationships with *proboscideus* and *similis*, as Bergroth remarks. It appears to have been found on one occasion only, as the seven or eight specimens existing in collections bear identical data.

28. *Aradus (Aradus) parvicornis* sp. nov. (Plate III, fig. 28.)

Description.—Dark brown; posterior portion of pronotum between carinae, apical half of scutellum, and veins of inner half of corium, dull reddish yellow; membrane whitish hyaline; first antennal segment and apices of second and third inconspicuously pale; connexival segments reddish brown, each outlined on three sides with a strongly elevated, dark, granular ridge, the extreme apical angles dull yellowish; rostrum brown, paler toward base; legs brown, trochanters and apices of tibiae pale; ventral surface reddish brown with rather conspicuous paler markings.

Head a little longer than broad (26 to 24), much longer than pronotum (26 to 20); tylus rather large, somewhat bulbous; impressions of vortex narrow, deep, parallel, close to eyes; preocular tubercles distinct, moderately acute; antenniferous spines very short, conical, moderately divergent, without lateral tooth; postocular tubercles distinct, obtuse; antennae (fig. 28c) extremely small, scarcely longer than head alone (fourth segment missing, probably as long as third), the first segment scarcely reaching basal third of tylus, length of second less than distance between eyes (12 to 16); rostrum extending not quite to base of prosternum. Pronotum (fig. 28d) strongly convex, with sharp transverse depression; lateral margins narrowly explanate, not reflexed, with coarse, irregular, long, blunt teeth; carinae well elevated. Scutellum (fig. 28d) broad, slightly shorter than head (25 to 26); basal elevation most pronounced at angles, with a narrow median longitudinal carina; sides moderately elevated. Hemelytra (♀) moderately narrowed, exposing disc of abdomen slightly at sides, extending a little beyond base of dorsal genital segment; corium to base of fourth; basal expansion of exocorium very moderate, elongate; mesocorium and endocorium with numerous moderately distinct cross-veins.

♂. Unknown.

♀ (fig. 28a). Posterior margin of dorsal genital segment very slightly emarginate in middle third, straight and slightly oblique each side; genital lobes, as seen from above, extremely short, their greatest length (near inner margin) about equal to one-fourth transverse width; abdomen oval, about one-third broader than pronotum (60 to 46), sides evenly rounded, without crenulation. Length, 5.8 mm.

Holotype.—♀; Vermejo, New Mexico, in my collection.

Paratype.—♀; Hideaway, Oregon, VII, 27, 1913 (W. D. Edmonston), United States National Museum, No. 24075.

A small and very rare species, related to *cincticornis*, but readily distinguished by the small antennae, broad scutellum, evenly rounded abdominal margins, and genitalic structure. The paratype lacks the antennae.

29. *Aradus* (*Aradus*) *opertaneus* sp. nov. (Plate III, fig. 29.)

Description.—Uniform dark brown; a pale mark at base of head; corium with very vague pale markings; apical angles of connexival segments indistinctly yellowish; membrane brown, with pale basal spot and more or less white along the veins.

Head longer than broad (30 to 27), much longer than pronotum (30 to 20); tylus rather long, compressed, slightly enlarged at middle; impressions of vertex, narrow, deep, parallel; preocular tubercles obtuse, scarcely elevated; antenniferous spines moderately slender and divergent, the lateral tooth small but distinct; postocular tubercles prominent, obtusely rounded; antennae (fig. 29c) moderately slender, about as long as head and pronotum together, the first segment extending a little beyond middle of tylus, length of second equal to width of head including one eye; rostrum reaching middle of prosternum, the prosternal ridges strongly elevated. Pronotum (fig. 29d) slightly convex, transverse depression moderately developed; sides slightly expanded and scarcely reflexed, with moderately coarse teeth; carinae rather feebly elevated. Scutellum longer than pronotum (30 to 20), broadly triangular; sides and disc very little elevated; apex narrowly rounded. Hemelytra (♀) strongly narrowed, exposing disc of abdomen at sides, extending at most to base of dorsal genital segment; corium about to apex of third; basal expansion of exocorium strong, evenly rounded; mesocorium with one, endocorium without distinct transverse veins.

♂. Unknown.

♀ (fig. 29a). Dorsal genital segment about twice as broad as long, posterior margin almost straight; lobes evenly rounded, finely denticulate; abdomen comparatively large, much broader than pronotum (70 to 47), elongate oval, rather pointed posteriorly; lateral margins almost entire, the notches slight. Length, 6.5 to 7.1 mm.

Holotype.—♀; Cass County, Minnesota, VI, 25, 1893 (O. W. Oestlund), in my collection.

Paratypes.—Females; same data, in University of Minnesota collection and in mine.

A species intermediate in some respects between the *proboscideus* and *similis* groups; most closely related to *similis*, from which it may be distinguished by the short rostrum, antennal and genitalic structure, and general coloration.

30. *Aradus (Aradus) similis* Say (Plate III, fig. 30.)1832. *Aradus similis* Say, *Het. Hem.*, p. 28; *Compl. Writ.*, I, p. 351.1873. *Aradus fascicornis* Walker, *Cat. Hem.-Het. Brit. Mus.*, VII, p. 36.

Distribution.—NOVA SCOTIA: VI (Wm. T. Davis). MAINE: Cumberland County, VI, 1916 (A. Nicolay); Orono, IV, 29, 1913, VI, 4, 1913 (H. M. Parshley). NEW HAMPSHIRE: Durham, IV, 19, 1906 (C. S. Spooner). MASSACHUSETTS: Cambridge, V, 19 (Hubbard & Schwarz); Forest Hills, XI, 8, 1916 (W. M. Barrows); Springfield, X, 31, 1901 (F. Knab); Sunderland, Mt. Toby, V, 12, 1918 (H. M. Parshley); Tyngsboro, V, 6, 1900 (F. Blanchard). CONNECTICUT: Meriden, V, 8, 1911 (A. B. Champlain); Stonington, V, 1914 (I. W. Davis). NEW YORK: Chauncey, III, 31, 1918 (H. Notman); Cranberry Lake, VII, 9, 1917 (C. J. Drake); Ithaca; Staten Island, V, 10 (Wm. T. Davis); White Plains, III, 21, 1909, IV, 18, 1909 (J. R. de la Torre-Bueno); Yaphank, Long Island, V, 30, 1911 (C. E. Olsen). NEW JERSEY: Cedar Lake, X, 25, 1915 (H. G. Barber); Great Notch, V, 30, 1906 (H. G. Barber); Greenwood Lake, V, 8 (H. G. Barber); Manchester, IV, 15 (Wm. T. Davis); S. Amboy, III, 26, 1916 (F. M. Schott). PENNSYLVANIA: North Mountain, IX, 1, 1897 (C. W. Johnson); Wilmerding (M. Wirtner). DISTRICT OF COLUMBIA: Brightwood, V, 5, 1901 (O. Heidemann); Brookland, XI, 26, 1914 (L. O. Jackson); Washington, II, 21, 1897 (O. Heidemann). MARYLAND: Edgewood, XII, 8, 1918 (H. Dietrich). VIRGINIA: Virginia Beach, X, 7, 1901 (V. Beutenmuller). NORTH CAROLINA: Andrews, V, 1908 (F. Sherman); Goldsboro, V, 2, 1901 (F. Sherman); Sunburst, V, 1912 (F. Sherman); Tryon, 1903 (W. F. Fiske). GEORGIA. FLORIDA: Biscayne Bay (A. T. Slosson); Gulfport, I, 6, 1915 (A. G. Reynolds). OHIO: Cincinnati, V, 17, 1919 (C. Dury); Columbus, 3, V, 1901. MICHIGAN: Allegan, VIII, 18, 1913 (F. Psota). INDIANA: Bluffton, V, 4, 1902 (C. C. Dean); Wyandotte, V, 26, 1904. ILLINOIS: Chicago; McHenry, VIII, 23, 1881 (C. A. Hart); Palos Park, V, 8, 1904 (A. B. Wolcott); Urbana, X, 30, 1891 (McElfresh). WISCONSIN: Madison, IV, 2, 1907 (C. B. Hardenburg). IOWA: Ames, (H. Osborn). MISSOURI. KANSAS: Topeka. MISSISSIPPI: Agricultural College, IV, 11, 1915. TEXAS: Plano, X (E. S. Tucker); Willis.

Description.—Pale to blackish brown; third antennal segment more or less distinctly pale except at base, second sometimes with vague pale markings; disc and basal expansion of corium variably pale, the membrane whitish hyaline, sometimes with vague maculation; apical angles and sometimes apical margins of connexival segments, and inner margin of genital lobes, dull yellowish; apices of tibiae and sometimes of femor. pale. All light markings vary toward obsolescence.

Head as long as broad, much longer than pronotum (30 to 20); tylus moderate in size, sides nearly parallel; impressions of vertex deep, straight, slightly divergent anteriorly; preocular tubercles minute; antenniferous spines rather large, moderately divergent, the lateral tooth minute; postocular tubercles prominent, obtuse; antennae (fig. 30c) moderately slender, almost as long as head and pronotum together (47 to 50), the first segment

reaching middle of tylus, slightly variable in length and thickness, the second in length equal to or very slightly exceeding width of head between eyes; rostrum extending not quite to base of prosternum. Pronotum (fig. 30d) moderately convex, the transverse depression distinct; width slightly more or slightly less than width of hemielytra at widest point; lateral margins with irregular coarse teeth, the expanded portion narrowed anteriorly and posteriorly; carinae well elevated. Scutellum much longer than pronotum (31 to 20), elongate, pentagonal, sides angulate, parallel in basal third, straight to rather narrow apex, or sometimes more or less evenly arcuate, moderately elevated; disc slightly elevated before middle, with two shallow depressions at base. Hemielytra strongly narrowed, exposing disc of abdomen at sides; (♂) extending to genital lobes, corium to middle of fourth segment; (♀) about to middle of sixth, corium to apex of third; exocorium moderately and somewhat variably expanded at base; mesocorium with one, endocorium without distinct transverse veins, but with numerous fine transverse ridges more or less developed; abdomen broadly oval, sides distinctly notched.

♂ (fig. 30b). Fifth ventral segment about as long as sixth; genital segment rather short, strongly convex, carinate. Length, 5 to 7 mm.

♀ (fig. 30a). Dorsal genital segment twice as wide as long, the posterior margin arcuate, truncate at middle. Length, 6 to 8.5 mm.

Type specimens (United States) lost.

This species, commonly found about the shelf-fungus of birch (*Polyporus*), is very variable in color, size, and certain details of structure, but it is distinguishable by the form of the pronotum, short second antennal segment (which is of somewhat variable thickness), and usually by the antennal coloration, in addition to genitalic criteria. Mr. Blair, of the British Museum, has kindly sent for examination a specimen (Nova Scotia) from the type series of Walker's *fascicornis*; this represents a common pale brownish form with markings almost obliterated, although the third antennal segment is paler than the others. The second antennal segment is slightly longer than the distance between eyes and is rather slender. This specimen is a female, 7.7 mm. in length. Intergradations between this form, variety *centriguttatus*, and typical *similis* are of common occurrence, without relation to locality, and it is impossible to draw specific distinctions among them. It is interesting to note that Say was aware of the variability of his species, for he writes in connection with the original description: "The penultimate joint of the antennae is sometimes very dull and almost obsoletely whitish."

Aradus similis variety **centriguttatus** Bergroth

1887. *Aradus centriguttatus* Bergroth, Rev. Ent., vi, p. 246

1892. *Aradus similis* var. *centriguttatus* Bergroth, Proc. Ent. Soc. Washington, ii, p. 332.

Distribution.—With the typical form, but rarer in the North.

Description.—Coloration uniformly dark; third antennal segment concolorous; membrane generally black with a white spot near apex of scutellum; connexival spots obsolescent or absent. Otherwise like the typical form.

Type specimens in Bergroth's and Montandon's collections, collected in Florida by Ashmead.

Bergroth¹⁹ pronounces this form, originally described as of specific rank, to be "only a variety of *similis*," and knowing this eminent author's views on naming varieties, I have no doubt that he would consider the name *centriguttatus* as a pure synonym. However, I think it useful to provide this and similar striking variations with distinctive names, and *centriguttatus* is by no means the least worthy among them. As noted above, we find intermediate forms, with lighter brown color, paler membrane, and faintly yellowish third antennal segment, leading insensibly toward the typical variety.

31. Aradus (Aradus) shermani Heidemann (Plate IV, fig. 31.)

1907. *Aradus shermani* Heidemann, Proc. Ent. Soc. Washington, viii, p. 68.

Distribution.—QUEBEC: Ottawa, VI, 13, 1913 (G. Beaulieu); ONTARIO: Ormsby Junction, County Hastings, V, 23, 1911 (J. D. Evans); Sudbury, V, 18, 1889; Toronto, VIII, 20, 1913 (C. A. G.); Trenton, VI, 6, 1903 (J. D. Evans). MAINE: Orono, V, 22, 1914. NORTH CAROLINA: Southern Pines, I, 1904 (F. Sherman). GEORGIA.

Description.—Black; membrane with a small pale spot near apex of scutellum; extreme apical angles of connexival segments very obscurely dull reddish, often not noticeably so.

Head longer than broad (37 to 32), much longer than pronotum (37 to 25); tylus rather long, sides parallel; impressions of vertex deep, nearly parallel, widely separated; base of head with distinct oblique smooth pale lines, preocular tubercles small but distinct, acute; antenniferous spines slender, acute, strongly divergent, the lateral tooth small or obsolescent; postocular tubercles prominent, acute; antennae (fig. 31c) slender, as long as head and pronotum together, the first segment not quite reaching middle of tylus, the second slightly less in length than width of head including both eyes (29 to 31) and slightly longer than the third and fourth together (28 to 25); rostrum

¹⁹ Proc. Ent. Soc. Wash., ii, p. 332, (1892), and *in litt.*

extending over anterior fourth of meso-sternum. Pronotum (fig. 31d) rather flat, lateral margins not reflexed, the teeth comparatively even, but variable, often much smaller and more numerous than in the figure; carinae moderately elevated, the median pair nearly parallel in the male or moderately convergent at middle in the female. Scutellum longer than pronotum (35 to 25), triangular, sides straight or slightly curved from near base to narrow apex, slightly elevated; disc with low rounded prominence before middle, two depressions at base. Hemelytra (σ) broad, exposing scarcely more than the connexivum, reaching middle of genital lobes, corium beyond middle of fourth segment; (ρ) much more narrowed toward apex, reaching to middle of sixth segment, corium to base of fourth; exocorium moderately expanded at base; entire corium with numerous more or less distinct transverse veins.

σ (fig. 31b). Fifth ventral segment distinctly shorter than sixth, its apical margin broadly transverse and almost straight across middle; genital segment short, strongly convex, carinate; abdomen broadly oval, crenate. Length, 6.5 mm.

ρ (fig. 31a). Dorsal genital segment more than one-half as long as broad (18 to 30), the posterior margin variably emarginate at middle, straight, oblique laterally; abdomen elongate, oval, lateral margins notched. Length, 8 to 8.8 mm.

Type specimens (Southern Pines, North Carolina), No. 9866. United States National Museum; and in the Heidemann collection, Cornell University.

This species, closely related to *similis* and to *acutus*, is to be distinguished by the color, antennal structure, and genital characteristics. The pronotal teeth are usually rather small and even, but they exhibit considerable variation, with intermediates which are often asymmetrical, between the extremes. A male specimen from Greensburg, Pennsylvania, included by Heidemann in the type series, is an obscurely marked example of *acutus*, identical with another having the same data, which Heidemann placed with his *acutus* series. There are several specimens of *shermeni* in collections, determined by Van Duzee as *similis* variety *centriguttatus*.

32. *Aradus* (*Aradus*) *acutus* Say (Plate IV, fig. 32.)

1832. *Aradus acutus* Say, Het. Hem., p. 28; Compl. Writ., I, p. 351.

Distribution.—MAINE: Norway (O. O. Stover). NEW HAMPSHIRE: VIII, 1850 (Harris Coll.); Temple, V, 26, 1900 (F. Blanchard). NEW JERSEY: Angelsea, IV, 11 (H. G. Barber). DISTRICT OF COLUMBIA: Brightwood, III, 4 (O. Heidemann); Rock Creek; Washington, XII, 1, 1895 (O. Heidemann). DELAWARE: X, 1879. MARYLAND: Baltimore, V, 10 (P. R.

Uhler). PENNSYLVANIA: Greensburg (M. Wirtner); St Vincent (M. Wirtner). VIRGINIA: Great Falls, IX, 5, 1918 (W. L. McAtee). NORTH CAROLINA: Blantyre, V, 1908 (F. Sherman); Lexington, III, 29, 1905 (F. Sherman); Raleigh, XI, 17, 1905; Southern Pines, XII, 9, 1915 (A. H. Mance); Tryon, IV, 17, 1903 (W. F. Fiske). GEORGIA: Dewitt, III, 28, 1912 (C. S. Spooner); Everett, (W. F. Fiske). ALABAMA: Mobile, I, 27, 1912 (H. P. Loding). [FLORIDA, *sec.* Bergroth.] OHIO: Chillicothe, V, 21, 1904 (Swezey). INDIANA: Hoesville, VI, 4, 1911 (A. B. Walcott). ILLINOIS: Cobden, IV, 28, 1882 (C. A. Hart); Devil's Neck, VI, 7, 1905 (C. A. Hart); Havana, V, 1, 1912 (C. A. Hart). MISSOURI: St. Louis, II, 24, 1876. MISSISSIPPI: Jackson, II, 3, 1879 (E. A. Schwarz). KANSAS. ARKANSAS. COLORADO: West Cliff. TEXAS: Austin (C. T. Brues); Dallas; Mt. Home, III, 26, 1906 (F. C. Pratt); Paris, II, 27, 1904 (C. T. Brues). MONTANA: Helena, VII, 21, 1907 (W. M. Mann). WASHINGTON. [CALIFORNIA, *sec.* Bergroth]

Description.—Blackish brown, the surface thickly strewn with fine whitish granules, forming a distinct pattern especially on connexivum; basal expansions of corium and some of the veins, discal spots and apical angles of connexival segments, and disc of genital lobes, dull yellowish; dorsum black, with triangular extensions along connexival suture; antennae and rostrum black; legs black, the tibiae paler, apices of femora and tibiae dull reddish yellow; ventral surface of abdomen black to reddish brown, with indefinite pale marginal markings. In very dark specimens the markings are obscure.

Head longer than wide (35 to 31), longer than pronotum (35 to 28); tylus moderate in size, sides almost parallel; impressions of vertex narrow, deep, almost parallel; preocular tubercles small; antenniferous spines slender, acute, strongly divergent, the lateral tooth scarcely developed; postocular tubercles very distinct, acute; antennae (fig. 32c) clavate, a little shorter than head and pronotum together (60 to 63), the first segment reaching middle of tylus, the second in length equal to width of head including both eyes, distinctly longer than third and fourth together (31 to 23); rostrum extending nearly to middle of mesosternum. Pronotum (fig. 32d) flat, the lateral margins irregularly crenulate, not reflexed, a few large teeth anteriorly; carinae moderately elevated. Scutellum longer than pronotum (33 to 28), sides slightly arcuate from base, sinuate toward the rounded apex, slightly elevated at middle; base slightly elevated, with three very faint longitudinal carinae. Hemelytra (σ) extending to genital lobes, corium about to middle of fourth segment; (φ) extending not quite to genital segment, corium to base of fourth; abdominal disc exposed at sides; exocorium distinctly expanded; mesocorium and endocorium usually with one distinct transverse vein.

σ (fig. 32b). Fifth ventral segment as long as sixth; abdomen oval, rounded posteriorly, the margins slightly notched. Length, 7 to 8 mm.

φ (fig. 32a). Dorsal genital segment not quite one-half as long as broad; posterior margin sinuate, truncate at middle; abdomen ovate, rather pointed posteriorly, the margins slightly notched. Length, 8 to 9.6 mm.

Type specimens (Florida and Indiana) lost.

This widely distributed and locally common form is to be recognized by the conspicuous pattern of pale granules and yellowish markings, long second antennal segment, and short first female genital segment. It was clearly characterized by Say and has been correctly identified by most students, although Heidemann in several instances determined specimens of *inornatus* as the present species, probably during the earlier years of his studies.

33. *Aradus* (*Aradus*) *inornatus* Uhler (Plate IV, fig. 33.)

1876. *Aradus inornatus* Uhler, Bull. U. S. Geol. Geog. Surv., 1, p. 323.

Distribution.—QUEBEC: Lanoraie, VI, 15, 1915, (J. I. Beaulne); Fort Coulonge, VI, 9, 1918 (E. C. Van Dyke); Ottawa, V, 25, 1914. ONTARIO: Grimsby, V, 2, 1913 (J. F. Brimley); Sudbury, 1889; Trenton, 1899 (J. D. Evans). MAINE: Orono, V, 1, 1914 (H. M. Parshley). NEW HAMPSHIRE: Claremont, VI to X; Hanover (C. M. Weed); Merrimack, V, 11, 1900 (F. Blanchard). MASSACHUSETTS. [PENNSYLVANIA, sec. Bergroth.] DISTRICT OF COLUMBIA: Washington, IV, 16 (O. Heidemann). MARYLAND. VIRGINIA: Great Falls, IX, 5, 1916 (H. G. Barber). NORTH CAROLINA: Raleigh, II, 17, 1906; Wilmington Beach, IV, 6, 1914 (H. G. Barber). [SOUTH CAROLINA; GEORGIA, sec. Bergroth.] TENNESSEE. MICHIGAN: Lake Superior (C. A. Hart). ILLINOIS. WISCONSIN: Madison, VI, 1, 1914 (A. H. A.). SOUTH DAKOTA: Hill City.

Description.—Dull light to dark brown, the connexivum paler and sometimes vaguely spotted; antennae darker toward apex; membrane uniformly brown; ventral surface of abdomen reddish brown.

Head much longer than broad (40 to 33), longer than pronotum (40 to 37); tylus rather long, slightly enlarged at middle; impressions of vertex narrow, deep, nearly parallel; preocular tubercle acute, moderate or minute in size; antenniferous spines slender, slightly divergent, the lateral tooth obsolete; postocular tubercles large, acute; antennae (fig. 33c) moderately slender, shorter than head and pronotum together (72 to 77), the first segment reaching middle of tylus, the second longer than width of head including both eyes (40 to 33), as long as head; rostrum not reaching middle of mesosternum. Pronotum (fig. 33d) flat, the transverse depression slight, lateral margins coarsely toothed, especially anteriorly, and scarcely reflexed; carinae feebly elevated. Scutellum as long as pronotum, sides rather irregularly curved from base to apex, shape tending toward pentagonal; sides feebly and variably elevated; apex narrowly rounded; disc and basal angles feebly elevated. Hemelytra (♂) reaching genital lobes, corium to apex of fourth segment; (♀) scarcely reaching dorsal genital segment, corium to base of fourth; exocorium moderately expanded; mesocorium with one or two, endocorium without very distinct transverse veins.

♂ (fig. 33b). Fifth ventral segment slightly longer than sixth; genital segment short, strongly convex; abdomen broadly oval, crenate. Length, 8.5 mm.

♀ (fig. 33a). Dorsal genital segment twice as wide as long, the posterior margin very obtusely angulate as a whole; abdomen narrowly oval, moderately produced posteriorly, the margins slightly notched. Length, 10 mm.

Type specimen (Maryland) in the Uhler collection, United States National Museum, No. 24080, lectotype.

This species, which has often been misunderstood by students and sometimes determined as *acutus*, is not found west of the Rocky Mountains, as defined here. It is readily recognized by its uniform coloration, long and regularly enlarged second antennal segment, flattened pronotum, feeble carinae, etc., according to the criteria given in the table of species. The original series, from which Uhler drew up his description, contains two species, one of which, occurring in the Pacific Coast region, has been described by Van Duzee²⁰ as *blaisdelli*. In selecting single type specimens of Uhler's species, I have as a rule chosen the one which bears Uhler's label with the specific name, but in this case it has seemed advisable to depart from this principle in order to avoid the necessity of changing names. A Maryland example, mentioned in connection with the original description, has therefore been denominated the type of *inornatus* (although it is unfortunately somewhat imperfect). The specimen which bears Uhler's label is without definite locality and has an abnormal pronotum, but it is certainly an example of the western *blaisdelli*. I can see no useful purpose to be served in selecting this specimen, and much against such a course; Uhler did not name definite types and doubtless it is merely the first specimen, as his arrangement originally stood, which bears the label.

34. *Aradus* (*Aradus*) *blaisdelli* Van Duzee (Plate IV, fig. 34.)

1920. *Aradus blaisdelli* Van Duzee, Proc. California Acad. Sci., (1), ix, p. 333.

Distribution.—BRITISH COLUMBIA: Vernon, V, 31, 1917 (M. H. Rulmann). WASHINGTON: Pressy's, Wenass V. (W. T.), VII, 6, 1882 (S. Henshaw). MONTANA: Bonner, V, 26, 1904; Florence, VI, 16, 1912; Lo Lo, VI, 10, 1912. NEVADA. CALIFORNIA: Huntington Lake, Fresno County, 7000 to 8000 ft, VII, 7 to 22, 1919 (E. P. Van Duzee); Lake Tahoe, VIII, 10, 1891; Mohave Desert, Holcomb Valley (Ariz.?) ; Oak Grove.

²⁰ Proc. Cal. Acad. Sci., (4), ix, p. 333, (1920).

Description.—Blackish brown; third antennal segment indefinitely paler, as a rule; basal expansion of corium and most of the veins pale brown; connexivum with variable yellowish brown spots, especially at apical angles of segments; basal spot and veins of membrane mostly white; legs brown, the coxae and apices of tibiae pale; edges of bucculae and plates forming rostral groove, and disc of abdomen ventrally, dull reddish or pale brown.

Structure about as in the preceding except as follows: Antennae (fig. 34c) about as long as head and pronotum together, the first segment scarcely reaching middle of tylus, the second in length more than equal to width of head including both eyes (43 to 32); rostrum reaching beyond middle of mesosternum, sometimes attaining metasternum. Pronotum (fig. 34d) with dorsal surface much more uneven, the transverse depression distinct, disc depressed on each side due to reflexion of lateral margins; sides anteriorly of variable shape, arcuate (cf. fig.) to nearly straight and oblique; carinae much more strongly elevated, the terminal tubercles of intermediate pair larger, surmounting the distinctly elevated anterior discal region. Scutellum slightly longer than pronotum, the sides a little more strongly elevated. Hemelytra and corium a little shorter in both sexes.

♂ (fig. 34b). Fifth ventral segment as long as sixth; abdomen broadly oval. Length, 9 mm.

♀ (fig. 34a). Dorsal genital segment less than twice as wide as long, the posterior margin strongly angulate; abdomen strongly narrowed and produced posteriorly. Length, 10.5 mm.

This species, while closely related to *inornatus*, is distinguished by characters sufficiently important to prevent its being regarded as a geographical race (see the table of species). As noted above, it was included by Uhler in his series of *inornatus*. Study of the type specimens has revealed certain minor inaccuracies in the description of this species and of others made known in the same paper (Van Duzee, 1920), especially in the statements of dimensions, which I have tried to correct, without particular comment in each case.

35. *Aradus* (*Aradus*) *hesperius* sp. nov. (Plate IV, fig. 35.)

Description.—Dark brown. the head, pronotum, scutellum, connexivum, and veins of corium thickly covered with pale grayish granules, which are usually very conspicuous; antennae sparsely sprinkled with similar granules; basal expansion of veins of corium sometimes yellowish; membrane with a distinct basal white spot, the veins more or less distinctly outlined with white; apical angle and a posterior discal spot of each connexival segment yellowish; rostrum and ventral surface of head and thorax dark brown; legs dark brown, the tibiae and femora pale at base and apex; ventral surface of abdomen light brown, often darker laterally.

Head much longer than broad (42 to 35), longer than pronotum (42 to 35); tylus long, slightly bulbous; impressions of vertex deep, moderately narrow, nearly parallel; preocular tubercles rather small, acute; antenniferous spines rather short, slender, variably divergent, the lateral tooth obsolescent; post-ocular tubercles large, acute, antennae (fig. 35c), rather slender, about as long as head and pronotum together, the first segment reaching not quite to middle of tylus, the second in length much more than width of head including both eyes (43 to 35), longer than head; rostrum reaching almost to metasternum. Pronotum (fig. 35d) moderately convex, the transverse depression distinct; lateral margins reflexed, with three or four large teeth anteriorly; carinae well elevated, the terminal tubercles of the intermediate pair moderately large. Scutellum pentagonal, the sides moderately sinuate beyond middle and distinctly though moderately elevated; discal elevation triradiate; base depressed; apex narrowly rounded. Hemelytra rather broad, covering disc of abdomen; (σ) reaching genital lobes, corium a little beyond middle of fourth segment; (φ) almost to genital segment, corium beyond base of fourth; basal expansion of exocorium moderate, evenly rounded; mesocorium with one distinct transverse vein, this and endocorium with several others feebly and variably developed.

σ (fig. 35b). Fifth ventral segment a little longer than sixth; apical margin of sixth slightly and broadly emarginate at middle; genital segment large, strongly convex, the lobes short; abdomen rather elongate oval, with margins notched. Length, 7.5 to 8 mm.

φ (fig. 35a). Dorsal genital segment about twice as broad as long, the anterior and posterior margins about equally curved, the latter more angulate, transverse or slightly emarginate at middle; abdomen narrowly oval, strongly produced posteriorly, with margins slightly notched. Length, 9 to 10 mm.

Holotype.— φ ; Arizona, in the Uhler collection, United States National Museum, No. 24076.

Allotype.— σ ; same data.

Paratypes.— σ and φ , same data; φ , Colorado; σ and φ , Williams, Arizona, VI, 7, V, 26 (Barber and Schwarz), United States National Museum and my collection.

Related to *inornatus* and *blaisdelli*, from which it may be distinguished by the form of the second antennal segment and of the pronotum, and by numerous details of color and structure.

36. *Aradus (Aradus) approximatus* sp. nov. (Plate IV, fig. 36.)

Description.—Uniform light grayish brown; pale granules of surface forming a pattern of variable but never great distinctness; antennae dark beyond middle of second segment; membrane brownish, with more or less distinct darker maculation, and faint pale basal spot; disc of abdomen dorsally bright red.

Similar in structure and habitus to *inornatus*, except as follows: Second antennal segment (fig. 36c) suddenly enlarged in apical third. Pronotal margins (fig. 36d) less broadly expanded and rather irregular in outline, the teeth very uneven.

♂ (fig. 36b). Fifth ventral segment slightly longer than sixth; genital segment very strongly convex, the lobes decidedly longer than in *inornatus*. Length, 8 mm.

♀. Genital structures about as in *inornatus* (cf. fig. 33a). Length, 10.5 to 11 mm.

Holotype.—♀; Agricultural College, Mississippi, IV, 14, 1915 (R. W. Harned), in my collection.

Allotype.—♂; Mount Katahdin, Maine, VIII, 26, 1902 (H. G. Barber), in Barber's collection.

Paratypes.—♂, Wyandanch, Long Island, New York, VI, 18, 1916 (F. M. Schott); ♀, Prospertown, New Jersey, in De la Torre-Bueno's collection; ♀, Thomasville, Georgia, III, 12, 1903 (Morgan Hebard), in Davis' collection; ♀, without data, in Van Duzee's collection.

This species, while closely related to *inornatus*, may be readily recognized by the strikingly different antennal structure and the pronotal characters.

37. *Aradus (Aradus) compressus* Heidemann (Plate IV, fig. 37.)

1907. *Aradus compressus* Heidemann, Proc. Ent. Soc. Washington, VIII, p. 70.

Distribution.—BRITISH COLUMBIA: Vancouver Island, IV, 3, 1898 (G. W. Taylor). WASHINGTON: Lake Cushman, Mason County, VII, 14, 1919 (F. M. Gaige); Paradise Park, Mount Rainier, 6000 ft., VII, 15, 1905 (E. C. Van Dyke); Seattle (Ulke); "W. T." OREGON: Dille.

Description.—Black, finely granulate; postero-lateral margins of pronotum, narrow posterior margins or at least apical angles of connexival segments, and inner margins of genital lobes, reddish yellow; basal expansion of corium and narrow sides of scutellum sometimes obscurely pale; rostrum and legs light, ventral surface dark reddish brown.

Head longer than broad (40 to 32), longer than pronotum (40 to 32); tylus long, strongly compressed, enlarged somewhat toward base; impressions of vertex short, broad, deep, connected posteriorly, behind each a pale, smooth, oblique line; preocular tubercles distinct, moderately acute; antenniferous spines rather stout, conical, moderately divergent, the lateral tooth obsolescent; postocular tubercles very low, rounded; eyes prominent, substylated; antennae (fig. 37c) moderately slender, almost as long as head and pronotum together (70 to 75), the first segment reaching middle of tylus, the second in length slightly more than equal to width of head including both eyes; rostrum

reaching apex of mesosternum. Pronotum (fig. 37d) moderately convex, lateral margins minutely and regularly granulate, strongly reflexed; carinae very strongly elevated; disc transversely rugulose posteriorly; posterior lobes strongly deflexed. Scutellum much longer than pronotum (50 to 32), elongate, cordate; sides strongly elevated, sinuate; apex rather broadly rounded; disc very slightly elevated before middle. Hemelytra (♂) broad, covering abdomen and extending to apex, corium to base of fifth segment; (♀) narrower, exposing connexivum, extending over genital segment, corium to middle of fourth; exocorium moderately expanded, less so in the male; entire corium with numerous rather well-defined transverse veins.

♂ (fig. 37b). Fifth ventral segment distinctly shorter than sixth; genital segment short, strongly convex, carinate, the lobes long; abdomen oblong-oval, the margins notched. Length, 8 mm.

♀ (fig. 37a). Dorsal genital segment much as in *borealis* (cf. fig. 38c); abdomen broadly oval, the margins entire anteriorly. Length, 8 to 9.5 mm.

Type specimens (Seattle, Washington, and "W. T."), United States National Museum, No. 9868, and Cornell University Collection paratype No. 250.1 (Heidemann collection).

This is a very rare species, confined to the Northwest, according to present knowledge; it is distinct in most of its characters. The form of the female genital lobes is somewhat variable, the inner margin being almost evenly rounded in some individuals.

38. *Aradus (Aradus) borealis* Heidemann (Plate IV, fig. 38.)

1909. *Aradus borealis* Heidemann, Proc. Ent. Soc. Washington, XI, p. 190, fig. 4.

Distribution.—QUEBEC: Ottawa. MAINE: Mount Katahdin, 5215 ft., VIII, 19, 1902 (H. G. Barber). NEW HAMPSHIRE: Mount Washington, Lake of the Clouds, VII, 2, 1896 (F. Blanchard). MICHIGAN: Marquette, VI, 26 (Hubbard and Schwarz). SASKATCHEWAN: Saskatchewan River (R. Kennicott). CALIFORNIA: Mount Tallac, Eldorado County, 7000 ft., VII, 6, 1915 (C. W. Woodworth).

Description.—Blackish brown; edge of scutellum at apex, posterior margins of connexival segments, and inner margins of genital lobes, dull reddish yellow; rostrum and legs rather light reddish brown; ventral surface of abdomen dark reddish brown, with vague darker markings.

Head slightly longer than broad (32 to 30), slightly longer than pronotum (32 to 28); tylus long, strongly compressed, suddenly enlarged at base; impressions of vertex short, broad, divergent anteriorly; preocular tubercles small, obtuse; antenniferous spines very short, conical, moderately divergent, the lateral tooth obsolescent; postocular tubercles absent; antennae (fig. 38c) moderately thick, slightly shorter than head and pronotum together (57 to 60), the first segment reaching middle of tylus, length of second somewhat less than width of head including both eyes (27 to 30); rostrum extend-

ing over anterior fourth of mesosternum. Pronotum (fig. 38d) moderately convex, the lateral margins moderately expanded and but slightly reflexed, with minute and regular granulation; carinae strongly elevated. Scutellum much longer than pronotum (40 to 28), elongate-cordate, sides strongly sinuate and well elevated except at narrowly rounded apex; disc with very low rounded elevation before middle. Hemelytra broad, scarcely exposing whole width of connexivum at most, (σ) attaining apex of abdomen, corium to base of fifth segment; (φ) reaching base of genital lobes, corium to middle or almost to apex of fourth; basal expansion of exocorium moderate, rather long, reflexed; mesocorium and endocorium with several moderately distinct transverse veins; abdomen ovate, widest behind middle.

σ (fig. 38b). Fifth ventral segment slightly shorter than sixth; genital segment rather short, moderately convex, carinate. Length, 6.6 mm.

φ (fig. 38a). Dorsal genital segment peculiar (fig. 38c). Length, 7.4 to 8 mm.

Type specimens (Mount Washington, New Hampshire and Marquette, Michigan), United States National Museum, No. 12711.

This is a boreal species of rare occurrence, well distinguished by structure of the pronotum, scutellum, and female genitalia. Heidemann's figure gives its general appearance very well.

39. *Aradus* (*Aradus*) *insignitus* sp. nov. (Plate IV, fig. 39.)

Description.—Black; the third antennal segment bright orange yellow.

Similar in structure to *uniformis*, except as follows: Tylus long, strongly compressed, slightly enlarged at middle; preocular tubercles slightly developed, obtuse; antenniferous spines short, stout; antennae (fig. 39c) as thick as front femora, the first segment scarcely reaching middle of tylus, length of second almost equal to width of head including one eye (17 to 19). Pronotum (fig. 39d) distinctly convex, the lateral margins slightly expanded and strongly reflexed; carinae well elevated. Scutellum obscured. Hemelytra obscured, apparently reaching almost to apex of abdomen; basal expansion of exocorium slight.

σ . Unknown.

φ (fig. 39a). Dorsal genital segment obscured; abdomen broadly oval, the lateral margins almost entire. Length, 5 mm.

Holotype.— φ ; Massachusetts (F. G. Sanborn), in my collection.

This species is founded on a single damaged specimen which has been repaired with gum so clumsily as to obscure the scutellum and hemelytra almost entirely, but the antennal, pronotal, and genital characteristics are so distinctive that there can be no possibility of confusing it with *uniformis*, its nearest ally.

40. *Aradus (Aradus) uniformis* Heidemann (Plate III, fig. 40.)

1904. *Aradus uniformis* Heidemann, Proc. Ent. Soc. Washington, VI, p. 231.

Distribution.—MASSACHUSETTS: Chicopee, VI, 25, 1903 (F. Knab); North Saugus, 1906 (F. Mosher); Springfield (J. A. Allen). NEW YORK: Flatbush, Long Island, VI, 19, 1897 (J. L. Zabriskie); Rockaway Beach, Long Island, V, 25, 1912 (H. G. Barber); Smith's Point, Fire Island Beach, Long Island, VII, 19, 1913 (J. R. de la Torre-Bueno); Wyandanch, Long Island, VI, 3; West Point. PENNSYLVANIA: Patton, VI, 14, 1903 (M. Wirtner). MARYLAND. VIRGINIA: Fortress Monroe, IV, 19, 1891 (E. A. Schwarz). NORTH CAROLINA: Lake Toxaway (A. T. Slosson); Southern Pines, 4, V, 1906 (S. W. Foster).

Description.—Dull black; third antennal segment yellow; apical angles and more or less of posterior margins of connexival segments dull reddish yellow.

Head as long as broad, slightly longer than pronotum (24 to 22); tylus moderate, sides parallel, slightly enlarged toward apex; impressions of vertex broad, shallow, nearly parallel; preocular and postocular tubercles absent; antenniferous spines small, slender, slightly divergent, the lateral tooth obsolescent or absent; antennae (fig. 40c) moderately robust, more slender than front femora, shorter than head and pronotum together (40 to 46), the first segment reaching middle of tylus, length of second about equal to distance between eyes; rostrum reaching almost to posterior margin of prosternum. Pronotum (fig. 40d) moderately convex, the lateral margins rather strongly expanded and slightly reflexed, minutely and evenly granulate; carinae moderately elevated. Scutellum somewhat longer than pronotum (27 to 22), rather broad (20 to 27), sides distinctly sinuate at middle, strongly elevated, apex variably rounded; a low rounded elevation in basal half. Hemelytra (♂) broad, covering most of connexivum, reaching nearly to apex of genital lobes, corium about to middle of fifth segment; (♀) moderately narrowed, exposing whole connexivum at sides, reaching apex of dorsal genital segment, corium almost to apex of fourth; exocorium slightly expanded; transverse veins of corium variable.

♂ (fig. 40b). Fifth ventral segment much shorter than sixth; genital segment short, very moderately convex, the lobes large; abdomen oblong-oval, broadest behind middle. Length, 4.7 to 5 mm.

♀ (fig. 40a). Posterior margin of dorsal genital segment transverse; abdomen broadly and evenly oval. Length, 5.3 to 5.5 mm.

Type specimens (Massachusetts, Pennsylvania, Virginia), United States National Museum, No. 8153; paratypes Nos. 255.1, 255.2 in Heidemann collection, Cornell University.

This is a very distinct species not uncommonly met with, especially in beach drift; it is readily recognized by the antennal form and coloration, pronotal structure, and broad form.

41. *Aradus (Aradus) tuberculifer* Kirby (Plate V, fig. 41.)

1837. *Aradus tuberculifer* Kirby, in Richardson, Fauna Bor.-Amer., iv, p. 278, pl. 6, fig. 5.

1873. *Aradus caliginosus* Walker, Cat. Hem.-Het. Brit. Mus., vii, p. 36.

1878. *Aradus tuberculifer* Kirby, in Bethune, Can. Ent., x, p. 213.

1913. *Aradus tuberculifer* Bergroth, Can. Ent., xlv, p. 3.

Distribution.—QUEBEC: Montreal; Ottawa, V, 28, 1887. MAINE: Holden, VI, 20, 1902 (F. A. Eddy); Orono (H. T. Fernald). NEW YORK: Cranberry Lake, VII, 24, 1917 (C. J. Drake); Rockaway Beach, Long Island, VI, 26, 1910 (Wm. T. Davis). MICHIGAN. MINNESOTA. ALBERTA: Edmonton, IV, 26, 1919 (F. S. Carr). ALASKA: Iditarod, X, 15, 1918 (Alice Twichell); Old Crow, VI, 18 to 20, 1912 (J. M. Jessup); Yukon (R. Kennicott). COLORADO: (Morrison). CALIFORNIA.

Description.—Black; basal expansion and veins of corium sometimes pale brownish; posterior margins of connexival segments narrowly reddish yellow; veins of membrane sometimes narrowly whitish hyaline; rostrum and legs dark reddish brown.

Head a little longer than broad (28 to 26); longer than pronotum (28 to 25); tylus rather long, narrow, sides parallel; impressions of vertex broad, shallow, nearly parallel; preocular tubercles distinct, obtuse; antenniferous spines short, conical, moderately divergent, the lateral tooth obsolescent or absent; postocular tubercles very low, rounded; antennae (fig. 41c) moderately slender, clavate, almost as long as head and pronotum together (50 to 53), the first segment extending a little beyond middle of tylus, length of second less than width of head including both eyes; rostrum reaching apex of mesosternum. Pronotum (fig. 41d) rather flat, the lateral margins somewhat strongly reflexed, finely granulate; carinae well elevated, variably sinuate. Scutellum much longer than pronotum (35 to 25), narrow, elongate, almost triangular; sides very strongly elevated, slightly arcuate, rarely angulate at basal third; apex acute; disc with a low rounded elevation before middle. Hemelytra (♂) broad, covering abdomen, extending beyond apex of abdomen, corium nearly to apex of fifth segment; exocorium very slightly expanded; (♀) moderately narrowed, exposing almost whole width of connexivum at most, extending nearly or quite to apex of dorsal genital segment, corium about to apex of fourth; exocorium moderately expanded; transverse veins of mesocorium and endocorium variably developed.

♂ (fig. 41b). Fifth ventral segment shorter than sixth; genital segment large, strongly convex; abdomen narrow, oblong-oval, the lateral margins nearly entire. Length, 6.5 mm.

♀ (fig. 41a). Posterior margin of dorsal genital segment obscure, the usual suture between disc and lobes being obsolete; abdomen rather broadly oval, the lateral margins notched or feebly crenate. Length, 7 to 7.3 mm.

Type specimens (Canada, lat. 65°), in the British Museum.

This boreal species is readily distinguished by the shape of the second antennal segment, and the pronotal and genitalic

structure. In redescribing it and pointing out the characters which separate it from *funestus*, Bergroth²¹ remarks that Uhler's records pertain to the latter, but this is not in all cases true, since I have seen an example of the present species correctly determined by Uhler. Evidently he did not distinguish between the two forms, although Loth came under his observation. From correspondence with Mr. Blair, of the British Museum, I am convinced that Bergroth is correct in treating *caliginosus* as a synonym of *tuberculifer*; drawings made from Walker's type indicate identical structure of the second antennal segment and no differences in the pronotum beyond the range of ordinary variation in the species. Careful examination of several specimens indicates that the remarkable structure of the dorsal genital segment of the female described by Bergroth, may be interpreted somewhat differently. It seems to me that the discal portion of this segment is not reduced in size, but rather that the usual transverse suture or margin, between the disc and the lobes, is in this species obsolescent, slight indications of its presence being sometimes visible under high magnification.

42. *Aradus (Aradus) parshleyi* Van Duzee (Plate V, fig. 42.)

1920. *Aradus parshleyi* Van Duzee, Proc. California Acad. Sci., (4), 1A, p. 336.

Distribution.—BRITISH COLUMBIA: Vernon, IV, 28, 1915 (M. H. Ruhmann).

Description.—Dark brown; postero-lateral margins of pronotum, basal expansions and most of veins of corium, posterior margins of connexival segments, and inner margins of genital lobes, yellowish; first antennal segment and basal half of second reddish brown; membrane dark brown, veins bordered inconspicuously with white; rostrum and legs pale reddish brown.

Head about as long as broad, longer than pronotum (30 to 25); tylus narrow, sides parallel; impressions of vertex broad, indefinite, curved; preocular tubercles distinct; antenniferous spines stout, conical, scarcely divergent, the lateral tooth absent; postocular tubercles small; base of head with oblique, smooth, pale lines; antennae (fig. 42c) moderately slender, almost as long as head and pronotum together, the first segment extending beyond middle of tylus, the length of the second about equal to width of head including one eye. Pronotum (fig. 42d) flattened, lateral margins minutely granulate, moderately expanded and reflexed; carinae distinctly elevated. Scutellum much longer than pronotum (35 to 25); sides moderately elevated, sinuate behind middle, nearly parallel in basal third; apex rounded; base scarcely

²¹ Canad. Ent., XLV, p. 4, (1913).

elevated. Hemelytra (♀) moderately narrowed, exposing most of connexivum, reaching apical angles of sixth segment, corium to apex of fourth; exocorium moderately expanded; mesocorium with one, endocorium without distinct transverse veins; membrane with numerous cross-veins toward apex ♂. Unknown.

♀ (fig. 42a). Posterior margin of dorsal genital segment obscure, narrowly emarginate at middle; abdomen oval, the margins almost entire. Length, 7.5 mm.

Type specimen (Vernon, British Columbia), in the National Collection at Ottawa.

In describing this species, of which but a single specimen has been found, Van Duzee compared it with *compressus*, but it is in reality extremely close to *tuberculifer*, from which it is distinguished by the color, structure of the scutellum, slight genitalic differences, and other details. It exhibits a similar modification of the dorsal genital segment.

43. *Aradus* (*Aradus*) *funestus* Bergroth (Plate V, fig. 43.)

1913. *Aradus funestus* Bergroth, Can. Ent., XLV, p. 4.

Aradus tuberculifer Auctt., in part.

Distribution.—ONTARIO: Hastings County (J. D. Evans). [DISTRICT OF COLUMBIA: Washington, VIII, 8 (O. Heidemann), sec. Van Duzee.] ALBERTA: Banff, VI, 16, 1918 (E. C. Van Dyke); Crowley, VII, 1, 1918 (R. N. Crystal); Edmonton, IV, 12, 1919 (F. S. Carr). MONTANA: Florence, VI, 3, 1912. WYOMING: Bridger Basin. COLORADO: Boulder, VI, 1899; Fort Collins (H. T. Fall); West Cliff; West Fork. ALASKA: Iditarod, IX, 5, 1917 (Alice Twichell). BRITISH COLUMBIA: Kleena Kleena, Tatler Lake, XII, 1915 (S. H. Coldwell); Metlakatla, IX, 1910 (J. H. Keen); Revelstoke, VII, 4 to 6, 1905 (J. C. Bradley); Vernon, X, 7, 1918 (W. Downes). WASHINGTON: Ellensburg; Lake Cushman, Mason County; North Yakima, IX, 20, 1903; Pullman, III, VIII (C. V. Piper). IDAHO: Moscow. NEVADA. ARIZONA: Mohave Desert. Holcomb Valley (Calif.). CALIFORNIA: Delglades, VI, 1 to 6, 1908; Fort Crook.

Description.—Black, sometimes with brownish tinge; basal expansion and veins of corium more or less obscurely yellowish; veins of membrane with distinct narrow, whitish hyaline borders; posterior margins of connexival segments yellowish; legs and rostrum dark reddish brown.

Head structure about as in preceding except characters of antennae (fig. 42c); their length about equal to that of head and pronotum together; length of second segment equal to width of head including both eyes. Pronotum (fig. 42d) distinctly convex, lateral margins rather narrowly expanded, slightly reflexed. Scutellum pentagonal, longer than pronotum (35 to 27); sides parallel in basal half, very strongly and sharply elevated; apex acute; discal elevation rounded, rather prominent. Clavus extending beyond apex of

scutellum. Hemelytra (♂) extending beyond apex of abdomen, corium almost or quite to base of sixth segment, connexivum covered, exocorium scarcely expanded; (♀) extending to apex of dorsal genital segment or farther, corium almost or quite to base of fifth, width variable, partly or wholly exposing connexivum at sides, exocorium slightly expanded at base; transverse veins of corium rather numerous, variable.

♂ (fig. 43b). Fifth ventral segment about two-thirds as long as sixth; genital segment very large, strongly convex with sixth ventral; abdomen narrow, oblong-oval. Length, 5.7 to 6.3 mm.

♀ (fig. 43a). Posterior margin of dorsal genital segment slightly and broadly arcuate, nearly straight at middle; abdomen narrowly oval. Length, 7 to 8 mm.

Type specimens (Canada, etc.) in Bergroth's collection.

This is a rather common species of wide distribution in boreal regions, easily recognized by the slender antennae and broad pentagonal scutellum. It has commonly stood in collections as *tuberculifer* Kirby.

44. *Aradus (Aradus) lugubris* Fallén (Plate V, fig. 44.)

1807. *Aradus lugubris* Fallén, Mon. Cim. Succ., p. 34.

1873. *Aradus fenestratus* Walker, Cat. Hem.-Het. Brit. Mus., VII, p. 36.

Distribution.—LABRADOR: West St. Modest. QUEBEC: Godbout, VII, 19, 1918 (E. M. Walker); Montreal Island, VI, 3, 1909 (G. Beaulieu); Ottawa, VI, 1, 1909; Port Neuf. ONTARIO: Maynooth, VII, 23, 1910 (J. D. Evans); Muskoka, VII, 1898 (E. P. Van Duzee); Rat Portage, VI, 11, 1905; Ridgeway (E. P. Van Duzee); Sudbury, 1889 (J. D. Evans). NOVA SCOTIA: Weymouth, V, 31, 1911. MAINE: Mount Katahdin, 3000 feet, VIII, 1902 (H. G. Barber); Norway; Orono, V, 10, 1914 (H. M. Parshley). NEW HAMPSHIRE: Milford (C. P. Whiting); Mount Washington, summit (A. T. Slosson). MASSACHUSETTS: Amherst, VII, 3, 1898; Beach Bluff, VI, 25. RHODE ISLAND: Kingston, VI, 17, 1906 (J. Barlow). NEW YORK: Bayshore, Long Island, IX, 4, 1910 (C. E. Olsen); Colden (E. P. Van Duzee); Ithaca, V, 7, 1904; Nyack, 1885 (J. L. Zabriskie); Rochester Junction, VI, 9, 1914 (M. D. Leonard). PENNSYLVANIA: Nicktown, VI, 1911 (M. Wirtner). DISTRICT OF COLUMBIA: Takoma Park, IV, 19, 1914 (J. D. Hood). HUDSON'S BAY TERRITORY: Ungava Bay (L. M. Turner). MICHIGAN: Marquette, VIII, 30, 1888; Newberry (R. Beebe). ILLINOIS: Algonquin, V, 10, 1896 (C. A. Hart). MINNESOTA. WISCONSIN: Beaver Dam, III, 10, 1910 (W. E. Snyder); Birmamwood, II (J. G. Sanders); Milwaukee, V. NORTH DAKOTA: Valley City, VI, 8, 1917 (P. W. Fattig). NEBRASKA: War Bonnet Canyon. MONTANA: Bozeman, VIII, 10, 1912. COLORADO: Boulder, V, 17 (T. D. A. Cockerell); Denver; Estes Park, 9350 feet, VIII, 25, 1920 (H. C. Severin); Fort Collins, V, 13, 1899; Georgetown, VII, 27, 1909 (W. J. Gerhard); Glenwood Springs (H. F. Wickham); Long's Peak Inn,

VI, 26 (T. D. A. Cockerell); Ouray (H. F. Wickham). NEW MEXICO: Cloudercroft, V, 25, 1902 (H. L. Viereck); Las Vegas Hot Springs, VIII, 22 (Barber and Schwarz); Las Vegas Range, top, VI, 25, 1901 (T. D. A. Cockerell); White Mountains, 6500 feet, VII, 18 (C. H. T. Townsend). ARIZONA: Chiricahua Mountains, V, 20 (Hubbard and Schwarz); Flagstaff, VII, 7 (Barber and Schwarz); Huachuca Mountains, VIII, 24; Mud Springs, Santa Catalina Mountains, 6500 feet, VII, 17 to 20, 1916 (Lutz and Rehn); Williams, VII, 7 (Barber and Schwarz). UTAH: Alta, 10,000 feet, V, 30; Beaver Ridge Mountains, 8000 to 10,000 feet, VIII, 20. ALASKA: Chitina Glacier, 30 miles north of Mount Saint Elias, V to VI, 1912 (D. W. Eaton); Iditarod, VIII, 19, 1918 (Alice Twichell); 60 to 75 miles north of Rampart House, VI, 23, 1912 (J. M. Jessup). ALBERTA: Banff Springs, VIII, 16 (R. P. Currie); Edmonton, IV, 26, 1919 (J. D. Evans). BRITISH COLUMBIA: Agassiz, VII, 18, 1902; Field, VII, 19, 1901; Groundhog Basin, Big Bend Country, VII, 24, 1905 (J. C. Bradley); Kaslo, VI, 13 (R. P. Currie); Kleena Kleena, Tatler Lake, X to XII, 1915 (J. C. Caldwell); Metlakatla, IX, 1910 (J. H. Keen); Revelstoke, VII, 1, 1905 (J. C. Bradley); Stickeen River (H. F. Wickham); Victoria. YUKON TERRITORY: near 60 Mile River, 1907 (T. P. Reilly). WASHINGTON: Ellensburg; Monroe, VII, 4, 1905 (E. C. Van Dyke); Olympia (T. Kincaid); Pullman, VII, 27, 1910 (J. A. Hyslop). OREGON: Portland (R. P. Currie). NEVADA: Ormsby County, VII (C. F. Baker). CALIFORNIA: Bryson, Monterey County, IV, 23, 1917 (E. P. Van Duzee); Castillea, VII, 1, 1912 (J. A. Kusche); Doble; Fallen Leaf Lake, Eldorado County, VII, 22, 1915 (E. C. Van Dyke); Eureka, VI, 20 (H. S. Barber); Fieldbrook, V, 19, 1903 (H. S. Barber); Fort Crook; Gilroy; Gold Lake Camp, Plumas County, VII, 19, 1916 (H. G. Dyar); Huntington Lake, Fresno County, 7000 feet, VII, 9, 1919 (E. P. Van Duzee); Inyo County, VII, 1913 (T. S. Brandegge); Los Angeles (D. W. Coquillett); Mesa Grande, Sonoma County, VII, 31, 1908 (F. E. Blaisdell); Mount Eddy, 9000 feet, Siskiyou County, VII, 28, 1918 (E. P. Van Duzee); Santa Cruz Mountains; Sequoia National Park, 9000 feet, VII, 19, 1907 (J. C. Bradley). PALAEARCTIC REGION.

Description.—Black, sometimes with brownish tinge; apical half of third antennal segment and sometimes extreme apex of second, and apical margins or angles of connexival segments, yellowish white; membrane whitish hyaline, with brownish maculation; ventral surface dull brown, the connexival segments spotted.

Head as long as broad, longer than pronotum (21 to 19); tylus thick, sides nearly parallel; impressions of vertex broad, rather shallow, parallel, completely connected posteriorly, forming a broad U; preocular tubercles distinct, obtuse; antenniferous spines short and rather stout, reaching middle of first antennal segment, moderately acute, parallel or slightly divergent, the lateral tooth absent; postocular tubercles low, rounded or obtuse; antennae (fig. 44c) moderately slender, often more or less flattened and variable in thickness, somewhat shorter than head and pronotum together (37 to 40), the first segment reaching middle of tylus, length of second equal to or slightly

greater than width of head between eyes; rostrum extending over anterior third of mesosternum. Pronotum (fig. 41d) moderately convex, transversely depressed before middle, the lateral margins narrowly and evenly expanded, not strongly reflexed, finely and regularly granulate; carinae moderately elevated. Scutellum longer than pronotum (29 to 19), elongate, triangular (29 to 20), sides strongly and sharply elevated; apex acute; discal elevation broad, rounded, extending beyond middle; base depressed. Hemelytra (♂ ♀) extending almost or quite to apex of abdomen, corium to base of fifth segment; exocorium not expanded at base; corium with numerous transverse veins, some of the cells more or less obscurely hyaline; endocorium with fine transverse wrinkles; corium wider than scutellum at level of middle of latter.

♂ (fig. 44b). Fifth ventral segment slightly longer than sixth, the apical margin of the sixth transverse, sinuate; genital segment large, moderately convex, the lobes short; abdomen oblong, not broader than hemelytra. Length, 4.5 to 6 mm.

♀ (fig. 44a). Posterior margin of dorsal genital segment transverse, arcuate only laterally; lobes as viewed from above (fig. 44c) rather long, posterior margin convexly arcuate; abdomen narrowly oval, wider than hemelytra, lateral margins entire. Length, 5 to 6.4 mm.

Type specimens (Westrogothia, Finland) not located.

This is a true holarctic species, of very wide distribution, as commonly met with in the New World as in the Old. It is distinguished especially by the comparatively stout antennae with second segment narrowed toward base, pronotal structure, and genital characters. The thickness and flattening of the antennae, and the posterior curvature of the female genital lobes are variable within narrow limits. Through the kindness of Mr. Blair I have been able to examine two specimens from Walker's type series of *fenestratus*. One, agreeing with the type specimen, is typical *lugubris*, the other is *abbas*; which confirms statements to the same effect made by Bergroth.²³

***Aradus lugubris* variety *nigricornis* Reuter**

1900. *Aradus lugubris* var. *nigricornis* Reuter, Medd. Soc. Fauna et Flora Fennica, xxvi, p. 134.

Distribution.—With the typical variety.

Description.—Like the typical variety, except that the antennae are entirely black.

This variety is almost as common as the typical form, which exhibits intergradational variation in the amount of white on the antennae. It is not of geographical significance, as it occurs

²³ Canad. Entom., xlv, p. 5, (1913).

throughout the range of the species. Variety *nigricornis* is to be added on page 134 of Van Duzee's Catalogue (1917).

45. *Aradus (Aradus) arizonicus* sp. nov. (Plate V, fig. 45.)

Description.—Black; base of head with oblique pale lines; connexivum with conspicuous yellow stripes; inner margins of genital lobes yellowish; cells of corium moderately clear hyaline; membrane whitish hyaline.

Head longer than broad (25 to 22), longer than pronotum (25 to 20); tylus long, sides nearly parallel; impressions of vertex, broad, rather shallow, parallel, completely connected posteriorly; preocular tubercles very distinct, moderately acute; antenniferous spines very short and thick, not reaching middle of first antennal segment, divergent, without lateral tooth; postocular tubercles prominent, rounded; antennae (fig. 45c) moderately slender, second and third segments compressed, much shorter than head and pronotum together (37 to 45); first segment scarcely reaching middle of tylus, second longer than distance between eyes (15 to 13); rostrum extending almost to middle of mesosternum. Pronotum (fig. 25d) moderately convex, the transverse depression obsolete; lateral margins narrowly and evenly expanded, moderately reflexed, finely granulate; carinae moderately elevated. Scutellum longer than pronotum (25 to 20), rather broadly triangular (25 to 20), sides parallel at extreme base, then slightly arcuate to the very narrowly rounded apex, strongly and sharply elevated; discal elevation rounded, triangular, not extending beyond middle; base depressed. Hemicytra (♀) extending to apex of dorsal genital segment, corium to apex of fourth: exocorium not expanded at base; corium hyaline, with numerous transverse veins; endocorium without wrinkles; corium narrower than scutellum at level of middle of latter.

♂. Unknown.

♀ (fig. 45a). Posterior margin of dorsal genital segment nearly straight; lobes as seen from above (fig. 45e) short, posterior margin concavely arcuate; abdomen oval, much wider than hemicytra, the lateral margins entire. Length, 5.4 mm.

Holotype.—♀, Santa Rita Mountains, Arizona, 5–8000 feet, VI (F. H. Snow), in my collection.

This species is closely related to *lugubris*, but well distinguished by the longer head, broader scutellum, narrower hemicytra, and differently shaped genital lobes. The flattening of the antennae is probably variable, as in *lugubris*.

46. *Aradus (Aradus) angustellus* Blanchard (Plate III, fig. 46.)

1852. *Brachyrhynchus angustellus* Blanchard, in Gay's Hist. de Chile, Zool., VII, p. 205.

1863. *Aradus angustellus* Signoret, Ann. Soc. Ent. France, (4), III, p. 576.

1873. *Aradus compressicornis* Stål, Enum. Hem., 3, p. 136.

1879. *Aradus angustellus* Berg, Hem. Argent., p. 138.

Distribution.—Chili. [Buenos Ayres. Patagonia. Colombia.]

Description.—Blackish brown; apical margins of connexival segments broadly pale; membrane maculated, pale along the veins.

Head slightly longer than broad (24 to 22), longer than pronotum (24 to 20); tylus comparatively large, thick, sides nearly parallel; impressions of vertex short, broad, rather deep, widely separated, parallel, connected posteriorly; preocular tubercles distinct, obtuse; antenniferous spines short, moderately stout, slightly divergent, without lateral tooth; postocular tubercles rather prominent, rounded; antennae (fig. 46c) moderately stout, shorter than head and pronotum together (38 to 44), the first segment reaching scarcely to middle of tylus, second and third very distinctly flattened, the second narrowed only at extreme base and as long as distance between eyes; rostrum reaching about to middle of mesosternum. Pronotum (fig. 46d) moderately convex, the lateral margins rather broadly expanded and distinctly reflexed, very finely granulate, variably sinuate anteriorly; carinae narrow, distinctly elevated. Scutellum much longer than pronotum (30 to 20), triangular; sides strongly elevated, variably arcuate; apex very narrowly rounded; discal elevation rather small and high; base depressed. Hemicytra (♀) extending almost or quite to genital lobes, corium over base of fifth segment; exocorium not expanded at base; transverse veins of corium numerous.

♂. Not at hand.

♀ (fig. 46a). Posterior margin of dorsal genital segment bisinuate, emarginate at middle; abdomen narrowly oval, but little broader than hemicytra. Length, 5 to 5.7 mm.

Type specimens (Chile) not located.

There are examples of this South American species in the Uhler collection (U. S. N. M.), from Chile, and it is reported by Stål and others from various parts of the continent. It is readily distinguished from *lugubris* by the antennal structure and genitalic traits. I have not seen specimens of this species other than those mentioned above, but its characters are so distinctive that I think there can be no doubt regarding the identification.

47. *Aradus (Aradus) abbas* Bergroth (Plate V, fig. 47.)

1889. *Aradus abbas* Bergroth, Bull. Soc. Ent. Belgique, p. clxxx.

Distribution.—NEWFOUNDLAND. QUEBEC: Bondville, VII, 28, 1915; Montreal, VII, 10, 1909 (H. Groh); Ottawa, VII, 7, 1907 (C. H. Young). ONTARIO: Maynooth, VII, 10, 1907 (J. D. Evans); Scotia, VII, 31, 1911 (M. C. Van Duzee); Sudbury, V, 18, 1889; Trenton, VII, 3, 1910 (J. D. Evans). NEW BRUNSWICK: St. John, VI, 14, 1908 (G. Beaulieu). MAINE: Ashland Junction, VIII, 16, 1910 (C. W. Johnson); Cumberland County, VI, 1916 (A. Nicolay); Fort Kent, VIII, 17, 1910 (C. W. Johnson); Machias, VIII, 17 (C. W. Johnson); Mount Katahdin, 3000 feet, VIII, 1902 (H. G. Barber);

Saddleback Lake, VII, 18 to 20, 1916. VERMONT: St. Johnsbury, VI, 27, 1906 (C. W. Johnson). NEW HAMPSHIRE: Mount Washington; Three Mile Island, V, 23, 1908 (F. Blanchard). MASSACHUSETTS: Beach Bluff, VI, 30, 1915 (H. M. Parshley); Boston, IX, 1; Concord, IV, 26, 1913 (W. Reiff); Mount Wachusett; Tyngsboro, 1893 (F. Blanchard). CONNECTICUT: New Haven, IV, 24, 1915 (Q. S. Lowry), VII, 31, 1911 (A. B. Champlain); Walkingtonford, VI, 5, 1912 (D. J. Caffrey). NEW YORK: Axton, Adirondack Mountains, VI, 12 to 22, 1901 (MacGillivray and Houghton); Buffalo, V, 27, 1911 (M. C. Van Duzee); Colden; Bayshore, Long Island, IX, 4, 1910 (C. E. Olsen); Fire Island Beach, Smith's Point, VII, 9, 1915 (J. R. de la Torre-Bueno); Hamburg, VI, 28, 1896 (E. P. Van Duzee); Ithaca, VII, 2, 1911 (C. R. Plunkett); Saranac Lake; Wading River, Long Island, V, 30, 1915 (F. M. Schott); White Plains, VIII, 11, 1911 (J. R. de la Torre-Bueno). PENNSYLVANIA: Penn Station, VII, 5, 1904 (M. Wirtner). DISTRICT OF COLUMBIA: Washington, VIII, 1, 1913 (R. C. Shannon). VIRGINIA: Falls Church, VII, 10 (N. Banks). NORTH CAROLINA: Lake Waccamaw, IV, 16, 1917 (R. W. Leiby); Terra Ceia, IX, 1919 (R. W. Leiby). FLORIDA: Jacksonville (A. T. Slosson). MICHIGAN: Marquette, VIII, 28, 1888; Sault Sainte Marie (H. Osborn). ILLINOIS: Chicago, VII, 13, 1911 (C. A. Hart). WISCONSIN: Cranmoor, VI, 15, 1910 (C. W. Hooker). ALASKA: Fort Yukon, VI, 26 to 30, 1916 (J. A. Kusche); Iditarod, VII, 7, 1918 (Alice Twichell). BRITISH COLUMBIA: Revelstoke, VII, 4 to 6, 1905 (J. C. Bradley); Vancouver, Stanley Park; Victoria. WASHINGTON: Hoquiam, VII, 22, 1904 (Burke); Lake Cushman, Mason County, VII, 8, 1919 (F. M. Gaige); Olympia (T. Kincaid); Tacoma. CALIFORNIA: Blue Lake, Humboldt County, VI, 20 to 27, 1907 (J. C. Bradley).

Description.—Black; apex of second and apical half of third antennal segments and apical angles of connexival segments white or yellowish; basal region of exocorium with a small, elongate yellowish translucent spot; membrane hyaline, with large dark quadrate spots; disc of abdomen beneath reddish, variably spotted.

Head about as long as broad and as long as pronotum; tylus short, slightly bulbous; impressions of vertex rather narrow and deep, widely separated, parallel, connected posteriorly, bounded posteriorly by oblique smooth lines; preocular tubercles distinct, obtuse; antenniferous spines small, acute, moderately divergent, the lateral tooth absent or obsolescent; postocular tubercles scarcely indicated; antennae (fig. 47c) very slender, about as long as head and pronotum together, the first segment reaching middle of tylus, the length of the second slightly greater than width of head including one eye (19 to 17); rostrum extending over anterior third of mesosternum. Pronotum (fig. 47d) convex, the expanded lateral margins very narrow and not reflexed, finely and irregularly granulate, often with a few minute denticles anteriorly, the anterior angles with irregular teeth, antero-lateral margins nearly straight or slightly concave; the postero-lateral angles somewhat variably shaped; carinae moderately elevated. Scutellum moderately elongate, nearly triangular, longer than pronotum (27 to 22); sides parallel in basal sixth, straight

or slightly arcuate to acute or very narrowly rounded apex, rather strongly and sharply elevated; the discal elevation rounded, higher than sides. Hemelytra (σ φ) extending almost or quite to apex of abdomen, corium about to middle of fifth segment, exocorium very slightly expanded at base; mesocorium with one, endocorium without distinct transverse veins.

σ (fig. 47b). Fifth ventral segment very much shorter than sixth on median line, exhibiting characteristic structure; genital segment large, very strongly convex; abdomen ovate, broadest behind middle, lateral margins notched. Length, 4.6 to 4.9 mm.

φ (fig. 47a). Posterior margin of dorsal genital segment with small notch at middle, arcuately oblique on each side; abdomen elongate-oval, broadest at middle, the lateral margins almost entire. Length, 5.1 to 5.9 mm.

This is a very striking species, widely distributed and represented in most collections; it is readily recognized by the slender, biannulate antennae, pronotal form, and genitalic characters. In the male the ventral segments are modified in a manner peculiar to this species and *gracilicornis*, which renders identification of this sex certain at a glance. In many collections specimens of *abbas* stand under the name *breviatus*, and, indeed, the relations between these species are still problematical, as noted below.

48. *Aradus (Aradus) breviatus* Bergroth (Plate V, fig. 48.)

1887. *Aradus breviatus* Bergroth, Rev. Ent., vi, p. 245.

Distribution.—East Florida (W. H. Ashmead).

Description.—Color and structure as in the preceding, except as follows: Postero-lateral margins of pronotum distinctly oblique (fig. 48d); hemelytra (φ) extending well beyond apex of abdomen.

σ . Unknown.

φ (fig. 48a). Dorsal genital segment apparently much abbreviated, the second genital segment visible from above (through the wings); ventral genital segments as in the preceding, except that the genital lobes are truncate, scarcely extending beyond apex of first genital segment. Length, 5 mm.

Type specimen (Florida) in Bergroth's collection.

Through the kindness of Dr. Bergroth I have been enabled to examine the type and only known specimen of this species. It presents no characteristics wholly foreign to *abbas*, except in the structure of the genital lobes and the dorsal genital segment. In size, form of pronotum and of scutellum, and details of the genital segments this individual exhibits certain minor peculiarities, but scarcely such as to be considered beyond the range of variation in *abbas*. For example, in a male specimen of *abbas*

from Florida, sent to me by Mrs. A. T. Slosson, the postero-lateral margins of the pronotum are of a form intermediate between the conditions shown in figs. 47d and 48d, while in all other respects the specimen is typical. The remnants of the genital lobes in Bergroth's type lack the spiracles normally situated on the margin and the apical edges show some signs of abnormality when viewed under the highest powers, so that the aberrant nature of the specimen may possibly be due to an injury occurring perhaps during one of the later nymphal stages. Bergroth writes: "I have not seen the male of this species and do not know how it is to be distinguished from *abbas* ♂; yet *breviatus* does not seem to be an abnormal specimen of *abbas*, as the female genitalia are quite symmetrical on each side"; and I agree that in the absence of adequate material from Florida judgment must be suspended. It is worthy of mention in this connection that in one example of *lugubris* which has come under my observation the genital lobe of one side is similarly abbreviated.

49. *Aradus* (*Aradus*) *gracilicornis* Stål (Plate V, fig. 49.)

1873. *Aradus gracilicornis* Stål, Enum. Hem., 3, p. 136.

1887. *Aradus gracilicornis* Bergroth, Rev. Ent., vi, p. 246.

Distribution.—GEORGIA: Thomasville, III, 6, 1903 (Hebard). FLORIDA: Baldwin; Biscayne Bay, I to VI (A. T. Slosson); Crescent City, IV, 1908 (E. P. Van Duzee); Lake Worth, VI, 2, 1887; St. John's River, V, 3, 1918. MISSISSIPPI: Agricultural College, IV, 30, 1915. TEXAS: Agricultural College. NEW MEXICO: Albuquerque. ARIZONA: Santa Rita Mountains, VI, 12, IX, 23. CUBA.

Description.—Black or dark brown, the hemelytra contrastingly pale; second and third antennal segments darker toward tip, sometimes very narrowly and inconspicuously pale at extreme apex; oblique pale lines at base of head very distinct; cells of corium hyaline, the veins yellowish or brown; base, apex, and more or less of lateral margin of corium beyond basal third, dark brown; clavus hyaline, dark at base and apex; membrane hyaline, with very faint brownish maculation; apical angles of connexival segments yellow, conspicuously in female, obscurely in male; rostrum and legs dark brown; ventral surface dark brown, sometimes marked with yellow along sutures, connexivum spotted.

Head a little, or scarcely, longer than broad, about as long as pronotum; tylus moderate in size, slightly bulbous; impressions of vertex short, nearly parallel, widely separated, connected posteriorly; preocular tubercles distinct, rather acute; antenniferous spines small, slender, moderately diver-

gent, without lateral tooth; postocular tubercles obsolescent; antennae (fig. 49c) slender, somewhat variable in thickness, as long as head and pronotum together, the first segment reaching about to middle of tylus, the length of the second almost equal to width of head including one eye; rostrum extending to middle of mesosternum. Pronotum (fig. 49d) convex, lateral margins narrowly expanded, evenly granulated, with a few coarse, variable teeth anteriorly; carinae well elevated. Scutellum longer than pronotum (28 to 22), sides parallel in basal fourth, then more or less distinctly sinuate to the narrowly rounded apex, moderately elevated; disc just before middle and basal angles moderately elevated, with connecting, lower ridges. Hemelytra (♂) extending to apex of abdomen, corium to middle of fifth segment, connexivum not fully exposed at sides; (♀) extending to middle or apex of dorsal genital segment, corium to apex of fourth, connexivum exposed; exocorium very slightly expanded at base; mesocorium with one, endocorium without distinct transverse veins.

♂ (fig. 49b). Fifth ventral segment deeply emarginate, very short at middle; genital segment very long, moderately convex; abdomen narrowly oval, the lateral margins entire. Length, 4.75 mm.

♀ (fig. 49a). Dorsal genital segment broad, posterior margin slightly arcuate, notched at middle; fifth ventral segment with a transverse, sinuate, linear impression before middle; abdomen rather broadly oval, lateral margins almost entire, feebly prominent at apical angles of connexival segments. Length, 5 to 5.8 mm.

Type specimen (Cuba) in the Stockholm Museum.

Although comparisons with the type have not been made, I think there can be no doubt that this species is correctly located, as I find entire agreement with the original description and with Bergroth's (1887) statement of the female characters. The structure of the genital segments in both sexes is sufficient to distinguish it from all others, except *abbas* ♂, the short genital lobes, as viewed from above, being characteristic. From *evermanni*, often determined as this species, it is readily separated by its larger size, non-reticulate corium, etc. I find that this species has often been misidentified as *breviatus*, an error due, no doubt, to the shortness of the genital lobes in the female, as viewed from above, although this abbreviation is by no means excessive and does not approach that characteristic of the species mentioned.

50. *Aradus (Aradus) marginatus* Uhler (Plate V, fig. 50.)

1893. *Aradus marginatus* Uhler, Proc. Ent. Soc. Washington, 11, p. 381.

Distribution.—УТАН: Alta, VI, 30, 1891 (E. A. Schwarz); Park City, VI, 17, 1891 (E. A. Schwarz).

Description.—Dark brown, with extensive pale markings, giving a general light brown effect; antennae light brown, apex of second and apical half of third pale, fourth black; preocular tubercles and antenniferous spines yellow at apex; postero-lateral region of pronotum and carinae posteriorly yellow; basal expansion, except anteriorly, and discal veins of corium yellow, the cells hyaline; membrane hyaline, with pale brown maculation; connexivum moderately dark brown, the segments posteriorly, and the inner margins of genital lobes, yellow; legs reddish brown, apices of femora pale; rostrum and ventral surface dark reddish brown, the abdomen marked laterally with yellow.

Head as long as broad, longer than pronotum (21 to 17); tylus short, broad, slightly bulbous; impressions of vertex moderately deep, irregular, widely separated, a little divergent anteriorly; preocular tubercles large, rather acute; antenniferous spines long, slender, strongly divergent, with a very small lateral tooth near base; postocular tubercles prominent, rounded; antennae (fig. 50c) slender, shorter than head and pronotum together (35 to 39); the first segment reaching middle of tylus, and but little beyond apices of antenniferous spines, the second in length about equal to width of head between eyes; rostrum extending over anterior third of mesosternum. Pronotum (fig. 50d) moderately convex, the lateral margins narrowly expanded and slightly reflexed, finely granulated, with a few small teeth anteriorly; carinae slender, slightly elevated. Scutellum longer than pronotum (21 to 17), shield-shaped, its width equal to length of pronotum; sides slightly curved, strongly elevated except at rounded apex; discal elevation triangular; extreme base depressed. Hemelytra (σ) extending almost to apex of abdomen, corium to apex of fourth segment, connexivum partially exposed at sides; elytra (η) narrowed but slightly toward apex, exposing connexivum at sides, extending to middle or nearly to apex of dorsal genital segment, corium to middle or apex of fourth; exocorium scarcely expanded; whole corium with numerous rather poorly developed transverse veins, not hyaline.

σ (fig. 50b). Fifth ventral segment a little shorter than sixth; genital segment slightly convex, rather long, the lobes short; abdomen ovate, broadest behind middle, margins almost entire. Length, 4 mm.

η (fig. 50a). Posterior margin of dorsal genital segment slightly arcuate, faintly emarginate at middle; abdomen narrowly oval, the lateral margins almost entire. Length, 5 mm.

Type specimens (Utah) in the Uhler collection, United States National Museum, No. 2479, lectotype, in the Heidemann collection, Cornell University, paratypes Nos. 254.1, 254.2.

Of this well-marked species no specimens have come to light since the discovery of the original series by Schwarz. From allied forms it is readily distinguished by its coloration as well as by details of antennal, pronotal, and genitalic structure.

51. *Aradus (Aradus) uniannulatus* sp. nov. (Plate VI, fig. 51)

Description.—Black; third antennal segment pale yellowish in apical third; base of head with oblique pale lines; posterior margins of connexival segments narrowly pale, the bands becoming indistinct inwardly; membrane hyaline, with faint brownish maculation.

Head about as long as broad and as long as pronotum; tylus rather short and broad, rounded at apex, enlarged at base; impressions of vertex broad, shallow, widely separated, nearly parallel, connected posteriorly; preocular tubercles small but distinct; antenniferous spines short, slightly divergent, without lateral tooth; postocular tubercles rather low, rounded; antennae (fig. 51c) very slender, almost as long as head and pronotum together (37 to 40), the first segment extending beyond middle of tylus and well beyond apex of antenniferous spines, the second in length equal to width of head including one eye; rostrum reaching almost or quite to middle of mesosternum. Pronotum (fig. 51d) slightly convex, the lateral margins moderately expanded and distinctly reflexed, denticulate anteriorly; carinae distinctly elevated. Scutellum somewhat longer than pronotum (23 to 20), rather broad (23 to 17), the sides nearly straight to apical third, then slightly arcuate to the very narrowly rounded or almost acute apex, slightly elevated, scarcely so toward apex; discal elevation rounded, slightly higher than margins at middle; base depressed except at angles. Hemelytra (♂) broad, covering connexivum, reaching apex of abdomen, corium beyond middle of fifth segment; (♀) very slightly narrowed toward apex, narrowly exposing connexivum at sides, reaching genital lobes, corium over base of fifth; exocorium not expanded at base; mesocorium and endocorium with numerous indistinct transverse veins; cells not hyaline.

♂ (fig. 51b). Fifth ventral segment about as long as sixth; genital segment rather long, moderately convex, the lobes short, with straight, oblique posterior margins and very small median notch; abdomen oblong-oval, the margins nearly entire. Length, 4.2 mm.

♀ (fig. 51a). Posterior margin of dorsal genital segment slightly arcuate, straight at middle; abdomen narrowly oval, the lateral margins entire; lobes rather short, sharply angulate at apex. Length, 4.4 to 5 mm.

Holotype.—♀; Edmonton, Alberta, IV, 17, 1919 (F. S. Carr), in my collection.

Allotype.—♂; Pinelawn, Long Island, New York, V, 12 (Wm. T. Davis), in my collection.

Paratypes.—Females; Edmonton, Alberta, V, 9, 1919; V, 23, 1919; V, 28, 1919 (F. S. Carr), in G. A. Moore's collection and in mine; Marquette, Michigan, VIII, 28, 1888, in my collection; Washington, D. C., XI, 20 (O. Heidemann), on *Pinus inops*, in the Heidemann collection, Cornell University, paratype No. 552.1.

This species, which the few specimens at hand show to be of rather wide distribution, is related to *marginatus* and to *evermanni*. From the former it is distinguished by color and by its longer second antennal segment, and from the latter by antennal coloration, opaque corium, and larger average size. The structural details of pronotum, scutellum, and genital segments are distinctive.

52. *Aradus* (*Aradus*) *evermanni* Van Duzee (Plate VI, fig. 52.)

1920. *Aradus evermanni* Van Duzee, Proc California Acad Sci (4), IX, p. 33.

Distribution.—TEXAS. ARIZONA: Huachuca Mountains, VII, 17, 1905 (H. G. Barber); Chiricahua Mountains, VI, 9 (H. G. Hubbard). CALIFORNIA: Gilroy; San Francisco, IX, 16, 1917 (E. P. Van Duzee).

Description.—Black; lateral margins of pronotum, corium except base and apex, and sometimes the three basal segments of antennae and the connexivum, obscure brown; connexivum with conspicuous pale bands.

Head slightly broader than long, about as long as pronotum; tylus short and very thick, slightly bulbous toward apex; impressions of vertex short, narrow, shallow, widely separated, parallel, connected posteriorly; preocular tubercles small; antenniferous spines short, rather stout, conical, moderately divergent, without lateral tooth; postocular tubercles well developed, obtuse; antennae (fig. 52c) shorter than head and pronotum together (28 to 34), the first segment reaching middle of tylus, length of second somewhat more than width of head including both eyes (13.5 to 12); rostrum extending almost to middle of mesosternum. Pronotum (fig. 52d) much shorter than head, the lateral margins slightly expanded and reflexed, very finely and regularly denticulate; carinae well elevated. Scutellum rather broad, variable (13.5 or 15 to 20), longer than pronotum (20 to 15), triangular, sides very slightly curved toward the narrowly rounded apex, moderately elevated; discal elevation slightly higher than margins, V-shaped. Hemelytra (σ φ) extending nearly to apex of abdomen, corium more or less over the fifth segment; basal expansion of exocorium very slight; corium hyaline, with numerous distinct transverse veins.

σ (fig. 52b). Fifth ventral segment two-thirds as long as sixth; genital segment rather large, slightly convex, the lobes very short; abdomen narrowly oval, apical angles of the segments slightly prominent. Length, 3.7 mm.

φ (fig. 52a). Posterior margin of dorsal genital segment transverse, slightly sinuate; genital lobes almost transverse, contiguous or nearly so at middle. Length, 4.5 mm

Type specimen (San Francisco, California), California Academy of Sciences, No. 686.

This species is distinguished by its small size, reticulate corium, and very distinct genital characters; I have come across several specimens in collections determined as *gracilicornis*, and some of Bergroth's and Heidemann's published records of the latter pertain to *evermanni*. The rostral length given in the original description is erroneous, the mistake being due to a superabundance of adhesive used in mounting the type specimen.

53. *Aradus (Aradus) falleni* Stål (Plate VI, fig. 53.)

1860. *Aradus Falleni* Stål, Rio Jan. Hem., 1, p. 68.

1873. *Aradus Falleni* Stål, Enum. Hem., 3, p. 136.

1886. *Aradus Falleni* Bergroth, Wiener Ent. Zeit., v, p. 97.

1898. *Aradus falleni* Champion, Biol. Cent.-Am., Het. II, p. 66, pl. 5, fig. 1.

Distribution.—RHODE ISLAND: Providence (C. A. Davis). CONNECTICUT: New Haven, VI, 18, 1919 (M. P. Zappe). NEW YORK: Rockaway Beach, Long Island, VI, 27, 1909 (J. R. de la Torre-Bueno); Yaphank, Long Island, IX, 26, 1912 (J. R. de la Torre-Bueno). NEW JERSEY: Nassau, III, 27, 1879 (E. A. Schwarz); Roselle Park, V, 13, 1915 (H. G. Barber). PENNSYLVANIA: Allegheny. DISTRICT OF COLUMBIA: Washington, VII, 10 (Kotinsky). MARYLAND: Baltimore, V, 27 (P. R. Uhler). VIRGINIA: Falls Church, V, 21 (N. Banks); Herndon, VIII, 1911 (H. G. Barber); Saint Elmo, X, 5, 1901; Virginia Beach, VII, 17. WEST VIRGINIA: Berkeley Springs, VII, 25, 1887. NORTH CAROLINA: Black Mountains, V, 18; Lake Nington, VI, 8, 1906 (F. Sherman); Raleigh, V, 1, 1904 (F. Sherman); Southern Pines, III, 4, 1915 (A. H. Manee); Swannanoa, VI, 1919 (F. Sherman); Tryon, V, 20, 1903 (W. F. Fiske). GEORGIA: Atlanta, V, 1899 (E. P. Van Duzee); Spring Creek, Decatur County, VI, 7 to 23, 1911 (J. C. Bradley). FLORIDA: Biscayne Bay, V, 21, 1887; Crescent City, IV, 1908 (E. P. Van Duzee); Jacksonville (A. T. Slosson); Key West, VI, 10, 1887; La Belle, IV, 28, 1912 (Wm. T. Davis); Lake Worth (P. R. Uhler); Miami, XII, 7, 1912 (F. Knab); Sanford, V, 3, 1908 (E. P. Van Duzee); West Palm Beach, V, 27, 1912 (C. Dury). MISSISSIPPI: Agricultural College, IV, 24, 1915; Vicksburg, VII, 14, 1899 (J. S. Hine). ILLINOIS: Homer, V, 1, 1915 (C. A. Hart); Urbana (C. A. Hart). MISSOURI: Columbia, VI, 1897 (F. J. Hall). ARKANSAS: Little Rock, VII, 13, 1904 (H. S. Barber). OKLAHOMA: South McAlester (Ind. Terr.) (H. F. Wickham). LOUISIANA: Baton Rouge, IV, 14, 1915 (T. H. Jones); Shreveport. TEXAS: Austin. NEW MEXICO: Albuquerque; Highrolls, VI, 31, 1902 (H. L. Viereck). ARIZONA: Bright Angel, VII, 10 (Barber and Schwarz); Fort Grant, VII, 15 (H. G. Hubbard); Santa Rita Mountains, VI, 13. BRITISH COLUMBIA: Revelstoke, VII, 1, 1905 (J. C. Bradley); Vancouver; Victoria. CALIFORNIA: Bryson, IV, 24, 1917 (E. P. Van Duzee); Fort Crook; Fresno, V, 21 (E. A. Schwarz); Los Angeles (D. W. Coquillett); Mount Eddy, summit, 9000 feet, Siskiyou County, VII, 28, 1918 (E. P. Van Duzee); Redding, VII, 7, 1918 (E. P. Van Duzee); San Diego County, VII, 9, 1913 (E. P. Van Duzee); Santa

Cruz Mountains; Sonoma County. MEXICO: Izamal, Yucatan, IV (C. H. T. Townsend). PANAMA: Las Cascadas, Canal Zone, III, 5, 1909 (A. H. Jennings). BRAZIL: Rio Janeiro. [WEST INDIES, sec. Bergroth.]

Description.—Black; antennae usually pale brown except first segment and base of second; cells of corium and membrane whitish hyaline; posterior margins of connexival segments and inner margins of genital lobes yellowish white; rostrum and legs brown.

Head slightly broader than long (21 to 20), about as long as pronotum; tylus short, sides parallel; impressions of vertex short, broad, shallow, broadly connected posteriorly; preocular tubercles distinct, obtuse; antenniferous spines rather short and stout, slightly divergent, without lateral tooth; postocular tubercles obsolescent; antennae (fig. 53c) moderately slender, much shorter than head and pronotum together (28 to 40), the first segment reaching about to middle of tylus, length of second about equal to width of head between eyes; proportions of the segments slightly variable; rostrum extending about to base of prosternum. Pronotum (fig. 53d) strongly convex, the lateral margins slightly expanded, distinctly reflexed, granulate; carinae distinctly elevated. Scutellum elongate, triangular, longer than pronotum (26 to 20); sides strongly elevated; disc slightly elevated near base; apex extremely narrowly rounded. Hemelytra (σ ♀) extending to genital lobes or further, corium to base of fifth segment: (σ) nearly parallel, covering most of abdomen, or (♀) a little narrowed apically, exposing connexivum at sides; exocorium very slightly expanded at base; mesocorium with one to three, endocorium without distinct transverse veins; veins of membrane simple. Abdomen oblong, lateral margins entire.

♂ (fig. 53b). Fifth ventral segment distinctly shorter than sixth, which is transverse and sinuate at apex medially; genital segment very short, moderately convex, fenestrate. Length, 3.75 to 4.25 mm.

♀ (fig. 53a). Dorsal genital segment transverse at apex. Length, 4.5 to 5 mm.

Type specimen (Brazil) in the Stockholm Museum.

This species is found throughout the New World, except in the most northern and southern regions, thus inhabiting most of the faunal zones, and yet it exhibits no considerable degree of variation and is always easily recognized. Its chief distinguishing characters are in the structure of the antennae and pronotum, the peculiar male genital segment, and the hyaline membrane. As remarked by Bergroth (1886), the color of the antennae is variable; usually light brown, but sometimes nearly black or dull white.

54. *Aradus (Aradus) snowi* Van Duzee (Plate VI, fig. 54.)

1920. *Aradus snowi* Van Duzee, Proc. California Acad. Sci., (4), 18, p. 339.

Distribution.—ARIZONA: Chiricahua Mountains, VI, 9 (H. G. Hubbard); Huachuca Mountains, VII, 13, 1905 (H. G. Barber); Palmerlee; Santa Rita Mountains, 5000 to 8000 feet, VI (F. H. Snow). NEW MEXICO: Alamogordo, V, 2, 1902 (Viereck and Rehn).

Description.—Black to dark brown; expanded pronotal margins and most of corial veins a little paler; cells of corium and membrane whitish hyaline, the latter with quadrate brownish spots; third antennal segment except sometimes extreme base, apical half of second, and basal half of fourth, yellowish white; apical angles of connexival segments with yellowish white spots, becoming larger posteriorly.

Head about as broad as long, longer than pronotum (19 to 15); tylus moderate in size, somewhat enlarged toward base; impressions of vertex broad, confluent, occupying most of surface between eyes and embracing an anterior elevated area; a narrow carina near each eye; preocular tubercles obsolescent; antenniferous spines rather short and stout, slightly divergent, without lateral tooth; postocular tubercles slight, rounded; antennae (fig. 54c) rather stout, much shorter than head and pronotum together (25 to 34), the first segment reaching a little beyond middle of tylus, length of second equal to distance between eyes; rostrum extending over anterior third of mesosternum. Pronotum (fig. 54d) moderately convex, the lateral margins narrowly expanded and but little reflexed, minutely granulate, translucent; carinae distinct, more or less arcuate. Scutellum elongate, triangular, much longer than pronotum (20 to 15); sides nearly or quite straight, strongly elevated; apex narrowly rounded; disc feebly elevated near base. Hemelytra (♂) reaching apex of abdomen, corium to middle of fifth segment, connexivum largely covered; (♀) reaching middle of dorsal genital segment, corium to middle of fourth, connexivum exposed at sides; exocorium scarcely expanded at base; mesocorium and endocorium with several more or less irregular transverse veins; veins of membrane mostly simple, the cross-veins obsolescent.

♂ (fig. 54b). Fifth ventral segment slightly longer than sixth, apical margin of latter broadly angulate; genital segment rather short, slightly convex; abdomen oblong-oval, the lateral margins entire. Length, 3.75 to 4 mm.

♀ (fig. 54a). Posterior margin of dorsal genital segment arcuate as a whole, the median emargination distinct, broader than space between genital lobes, widest anteriorly; abdomen oval, margins entire. Length, 4.5 mm.

Type specimen (Santa Rita Mountains, Arizona) in Van Duzee's collection.

This curious species, rather closely related to *falleni*, may be recognized immediately by the thick, black and white antennae, as well as by pronotal and genitalic characters. It was described

from a single specimen, but I have come upon a moderate number in collections, for the most part confused with *falleni*, even by Heidemann.

55. *Aradus (Aradus) cinnamomeus* Panzer (Plate VI, fig. 55.)

1794. *Aradus cinnamomeus* Panzer, Faun. Ins. Germ., heft 100, p. 20.

1873. *Aradus cinnamomeus* Stål, Enum. Hem., 3, p. 137.

Distribution.—MASSACHUSETTS. NEW YORK: Bay Shore, Long Island, VII, 3, 1909 (C. E. Olsen); Staten Island, IV, 4 (Wm. T. Davis); Wyandanch, Long Island, IV, 30, 1910 (Wm. T. Davis); Yaphank, Long Island, IX, 25, 1912 (J. R. de la Torre-Bueno). NEW JERSEY: Lahaway, V, 30, 1916 (C. E. Olsen); Lakehurst, VIII, 21, 1909. PENNSYLVANIA. DISTRICT OF COLUMBIA: Rock Creek, V, 27, 1891 (O. Heidemann); Washington, III, 27, VIII, 30 (O. Heidemann). MARYLAND: Glen Echo, VI, 2, 1893, (O. Heidemann); Plummer's Island, IV, 6, 1913 (W. L. McAtee); Sugarloaf Mountain, IX (O. Heidemann). VIRGINIA: Bluemont, VII, 1, 1914 (W. L. McAtee); Mount Vernon, II, 28, 1915 (W. L. McAtee); Rosslyn, IV, 9, 1905 (J. G. Sanders). WEST VIRGINIA: Berkeley Springs, VI, 4, 1886. NORTH CAROLINA: Southern Pines (A. H. Mance); Southport, IV, 10, 1914; Tryon, 1903 (W. F. Fiske). GEORGIA: Clayton, V, 18 to 26, 1911 (J. C. Bradley). ALABAMA: Eufaula, II, 24 (E. A. Schwarz). NEBRASKA: Glen, VIII, 1903. [MISSOURI. TEXAS.] CALIFORNIA: San Bernardino County, V, 30, 1916 (C. Dury). PALAEARCTIC REGION.

Description.—Yellowish or reddish brown; eyes and antennae toward apex darker; a series of small, double, dark spots just within connexival suture; membrane whitish hyaline.

Head very slightly broader than long, almost twice as long as pronotum; tylus very thick, rounded at apex, basal suture conspicuous; impressions of vertex shallow, indefinite, nearly parallel; preocular and postocular tubercles absent; antenniferous spines stout, strongly divergent, with distinct lateral tooth; antennae (fig. 55c) short and thick, very little longer than head, the first segment reaching about to middle of tylus, length of second scarcely one-third width of head including both eyes; rostrum reaching apex of mesosternum. Pronotum (fig. 55d.2) moderately convex or flat, the lateral margins moderately expanded, not reflexed, finely granulate or denticulate; carinae very slightly developed, obsolete anteriorly. Scutellum almost or quite one-half longer than pronotum, the sides slightly and obtusely elevated; disc very slightly raised in basal half; apex rounded. Abdomen broadly oval, lateral margins almost entire.

♂, stenopterous (figs. 55b, 55d.3). Pronotum small, flat; scutellum narrow. Hemelytra strongly narrowed at middle, enlarged at apex (as in fig. 60d.3), extending to base of genital lobes, corium to genital segment; corium and membrane with distinct venation. Fifth ventral segment about half as long as sixth; genital segment large, strongly convex, lobes rather long (fig. 55b). Length, 3.1 to 3.8 mm.

♀, dimorphic (fig. 55a). Posterior margin of dorsal genital segment emarginate at middle, slightly oblique at sides. Length, 3.8 to 5 mm.

Macropterous form (fig. 55d.2). Pronotum moderately convex; hemielytra broad, covering most of disc of abdomen, extending over base of dorsal genital segment, corium to apex of fourth.

Brachypterous form (fig. 55d.1). Pronotum reduced in size, flat; hemielytra slightly longer than scutellum, costal margin broadly rounded; membrane absent or slightly developed.

Type specimens not located.

This species, of holarctic range, is readily recognized by its small size, reddish color, short and thick antennae, etc. It is certainly a member of the subgenus *Aradus*, but in type of wing polymorphism it exhibits a striking similarity to *heidemanni*, of the subgenus *Quilbus*, an example of the interrelations which obtain throughout the genus. The narrow hemielytra of the male are in reality an indication of brachyptery in the broad sense, i. e., wing reduction, for the pronotum is characteristically flattened and the hind wings are absent. After comparison with numerous European examples, I find nothing distinctive in the American material, except possibly a somewhat smaller average size, and can thus confirm Stål's remark, "Specimen unicum texanum a speciminibus europaeis distinguere nequeo." *Cinnamomeus* is usually taken in heating pine branches, rather than by searching under sheets of dead bark, and in fact its habits are quite different from those of other species. It is to be hoped that Mr. Wm. T. Davis or some other well qualified American observer will give this matter his attention, since but little has been done on it in this country. Kiritshenko²⁴ writes as follows: "In the district of St. Petersburg, according to L. W. Bianki, *Aradus cinnamomeus* occurs in great quantities mostly but not exclusively on isolated healthy pines of medium size (about 3 to 5 inches in diameter), under pieces of bark which are almost entirely loosened, have about .3 to 1.0 mm. thickness, and abut with inner surface against sap-containing parts of the bark. These sap-containing parts usually have a quite light brown color easily recognizable from the rufous or rufous-brown color of the outer bark. . . . In the district of Lomja the damage done by *A. cinnamomeus* is appreciable, consisting in the

²⁴ Faune Russ'e, Hemipt., VI, p. 89, (1913).

drying up of the treetops of pines which are overrun by quantities of these insects, which keep mostly under the loose pieces of bark on the upper part of the stem." (Translation from the Russian by Dr. A. Petrunkevitch.) The species exhibits but little variation in the eastern states, but in the west a form has developed which seems to deserve subspecific rank.

Aradus (Aradus) cinnamomeus subspecies **antennalis** subsp. nov.

Description.—Similar to the typical form except as follows: Antennae dark brown, the third segment bright yellow in apical half. Hemelytra in brachypterous female extending almost or quite to middle of third abdominal segment, and provided with a narrow but distinct membrane along the oblique apical margin of the corium.

Holotype.—♀; Kelowna, British Columbia, V, 20, 1917 (R. C. Treherne), in the National Collection at Ottawa.

Allotype.—♂; same data.

Paratypes.—Vernon, British Columbia, IV, 12, 1915 (M. H. Ruhmann); Easton, Washington (A. Koelkele); Folsom, California, VII, 18, 1885; in my collection. Glen, Sioux County, Nebraska, VIII, 1903, in H. G. Barber's collection; Siskiyou County, California, VI, 1, 1911 (F. W. Nunnemacher), in W. J. Gerhard's collection.

This is a western form which cannot be separated specifically, but it is rather well distinguished by the characters given. Specimens taken in the eastern states lack the membrane, hardly a trace ever being noticeable, but European examples sometimes have it as well developed as in the western race. With the single exception of a specimen from northwestern Nebraska all material referable to *antennalis* which I have seen has been collected in the Pacific region. In California the typical form also occurs.

56. Aradus (Aradus) orbiculus Van Duzee (Plate VII, fig. 56.)

1920. *Aradus orbiculus* Van Duzee, Proc. California Acad. Sci., (4), IX, p. 337

Distribution.—CALIFORNIA: Huntington Lake, Fresno County, 7000 feet. VII, 17, 1919 (E. P. Van Duzee); Placer County, X. IDAHO: Moscow Mountain, X, 29, 1910 (J. A. Hyslop).

Description.—Blackish brown; inner margins of genital lobes and sometimes posterior margins of connexival segments reddish; legs and rostrum reddish brown.

Head much longer than broad (48 to 36); tylus long, one-half length of head, compressed, sides nearly parallel; impressions of vertex broad, slightly divergent, indefinitely connected posteriorly; preocular tubercles distinct, conical; antenniferous spines moderately acute, divergent, the lateral tooth rudimentary; postocular tubercles obsolete; antennae (fig. 56c) moderately slender, almost cylindrical, nearly as long as head and pronotum together (75 to 78), the first segment not quite reaching middle of tylus, the second longer than distance between eyes (30 to 20); rostrum (σ) extending just beyond apex of mesosternum, (ρ) to middle of mesosternum. Scutellum almost as long as head (45 to 48); sides elevated, disc almost entirely flat.

σ , stenopterous (fig. 56b). Pronotum much shorter than head (24-37), flattened posteriorly and in general reduced; carinae distinct. Hemelytra reaching apex of genital segment, strongly narrowed (somewhat less so than in fig. 60d.3), corium to fifth segment; exocorium strongly expanded at base; mesocorium with numerous transverse veins, endocorium without; cross-veins of membrane obsolescent. Hind wings apparently absent. Fifth ventral segment slightly shorter than sixth; genital segment rather short, moderately convex, the lobes long; abdomen oblong-oval, lateral margins almost entire. Length, 7.5 mm.; width, 3 mm.

ρ , brachypterous (figs. 56a, 56d). Pronotum much shorter than head (30 to 48), similar to that of male. Hemelytra abbreviated (fig. 56d), slightly longer than scutellum, longitudinal veins distinct, membrane vestigial. Posterior margin of dorsal genital segment nearly straight; abdomen broadly oval, the lateral margins almost entire, breadth at fifth segment equal to length behind scutellum. Length, 10.7 mm.; width, 5.5 mm.

Type specimens (California), Nos. 684 and 685, California Academy of Sciences.

This extraordinary species is not closely related to any other, but exhibits some affinity with *cinnamomeus* and with *heidemannii* in type of wing polymorphism, so that it may be placed as a connecting link, in some respects, between the subgenera. It is likely that the macropterous female exists and will be discovered, probably having the pronotum convex posteriorly and sinuate laterally (as in fig. 60d).

57. *Aradus (Aradus) insolitus* Van Duzee (Plate VII, fig. 57.)

1916. *Aradus insolitus* Van Duzee, Univ. of Calif. Pubs., Tech. Bulls., Ent., 1, p. 233.

1917. *Aradus insolitus* Van Duzee, Cat. Hem., p. 135.

Distribution.—BRITISH COLUMBIA: Vernon, IV, 12, 1915 (M. H. Ruhmann). CALIFORNIA: Fallen Leaf Lake and Glen Alpine, Eldorado County, VII, 12, 1915 (E. P. Van Duzee), VII, 22, 1915 (E. C. Van Dyke); Keen Camp, San Jacinto Mountains, VI, 8, 1917 (E. P. Van Duzee).

Description.—Black, the surface, including appendages, conspicuously marked with pale greenish granules; second antennal segment with a white apical ring of variable width; postero-lateral margins of pronotum narrowly pale; apex of scutellum broadly and indefinitely reddish yellow; apical angles of connexival segments and inner margins of genital lobes pale; femora and tibiae pale at apex; membrane whitish hyaline, with large brownish spots.

Head almost as long as broad (20 to 21), longer than pronotum (20 to 18); tylus of moderate size, slightly enlarged at middle; impressions of vertex short, deep, strongly divergent anteriorly; preocular tubercles obsolescent; antenniferous spines rather short, conical, divergent, the lateral tooth obsolescent; postocular tubercles slight; antennae (fig. 57c) moderately stout, somewhat shorter than head and pronotum together (34 to 38), the first segment reaching middle of tylus, second about as long as distance between eyes; rostrum short, extending slightly beyond apex of prosternum. Pronotum (fig. 57d) very slightly and irregularly convex, the lateral margins rather broadly expanded, not reflexed, finely and rather irregularly denticulate, straight or slightly concave posteriorly; carinae slightly elevated. Scutellum longer than pronotum (23 to 18), rather elongate, sides almost evenly arcuate from base, very slightly elevated; apex broadly rounded; discal elevation very slight. Hemielytra (♂) reaching genital lobes, corium to base of fourth segment, moderately narrowed, exposing most of connexivum at sides; (♀) reaching base or middle of dorsal genital segment, corium to base or nearly to apex of fourth, more strongly narrowed, exposing disc of abdomen at sides; basal expansion of exocorium moderate, evenly rounded, moderately reflexed; mesocorium and endocorium with several distinct transverse veins. Abdomen rather broadly oval, the lateral margins crenate.

♂ (fig. 57b). Fifth ventral segment slightly shorter than sixth; genital segment rather short, strongly convex, the lobes long. Length, 4.5 mm.

♀ (fig. 57a). Posterior margin of dorsal genital segment transverse at middle, sharply sinuate at sides near spiracles. Length, 4.8 to 5.2 mm.

Type specimens (Fallen Leaf Lake, California) in the Museum of the University of California.

This is a rare and very singular form, quite distinct in most of its characters, particularly in the shape of the pronotum. As Van Duzee remarks in connection with the original description: "The short rostrum allies it with *Quilnus* and in some respects it is intermediate between that subgenus and the more typical aradids."

Subgenus *Quilnus* Stål

1873. *Aradus (Quilnus)* Stål, Enum. Hem., 3, p. 137.

1913. *Aradus* subgenus *Quilnus* Kiritschenko, Faune de la Russie, Ins. Hém., vi, Livr. 1, p. 262.

Rostrum short, not or scarcely reaching base of head; the pronotum more or less distinctly trapezoidal, comparatively small and narrow, the lateral margins scarcely explanate. This group contains a few representatives in both the Old and the New Worlds, which have in common the few distinctly subgeneric characteristics mentioned. The coloration is prevailingly dark and a majority of the species exhibit pterygo-polymorphism.

58. *Aradus (Quilnus) niger* Stål (Plate VII, fig. 58.)

1873. *Aradus niger* Stål, Enum. Hem., 3, p. 137.

1901. *Aradus niger* Heidemann, Proc. Ent. Soc. Washington, IV, p. 389.

Distribution.—NOVA SCOTIA: VI (Wm. T. Davis). MAINE: Eastport, X, 12 (H. S. Barber); Mount Katahdin, 3000 feet, VIII, 1902 (H. G. Barber); Orono, IV, 29, 1914, V, 27, 1913 (H. M. Parshley). NEW HAMPSHIRE: Crawford's, IX, 26, 1916 (H. M. Parshley). MASSACHUSETTS: Northampton, X, 8, 1919 (Priscilla Butler); Pelham, VIII, 28, 1919 (H. M. Parshley). NEW YORK: Hamburg, IX, 22, 1901 (E. P. Van Duzee); Ithaca, IV, 16, 1897; Lake George, VIII, 22, 1893 (J. L. Zabriskie). NEW JERSEY: Lakehurst, IV, 25 (Wm. T. Davis). DISTRICT OF COLUMBIA: Brightwood, X, 22 (O. Heidemann); Washington, IV, 12 (O. Heidemann). VIRGINIA: Falls Church, IX, 19 (N. Banks). NORTH CAROLINA: Southern Pines, I, 1904 (F. Sherman). SOUTH CAROLINA. COLORADO: Boulder (G. Weston). TEXAS: Kirbyville, XI, 17, 1902 (A. D. Hopkins). MEXICO.

Description.—Black; basal expansion of corium, apical angles of connexival segments, and sometimes their posterior margins, very obscurely pale.

Head as long as broad; tylus very short, extending but little beyond first antennal segment, laterally compressed; impressions of vertex broad, very shallow, oval; preocular and postocular tubercles obsolete; antenniferous spines short, stout, slightly divergent, without lateral tooth; antennae (fig. 58c) very thick, much shorter than head and pronotum together (36 to 13), the first segment very broad, extending nearly to apex of tylus, length of second much less than distance between eyes (11 to 17); rostrum barely reaching level of posterior margin of eyes. Margins of pronotum finely granulate. Abdomen oval, the lateral margins almost entire.

Macropterous form (fig. 58d.1). Pronotum shorter than head (18 to 25), moderately convex, the lateral margins nearly straight, a little reflexed at middle; carinae feebly developed. Scutellum much longer than head (30 to 25), the sides slightly and obtusely raised; disc slightly elevated before middle. Hemelytra (♂ ♀) almost evenly narrowed from basal expansions, exposing connexivum, extending to genital segment, corium almost to apex of third segment; exocorium moderately expanded at base; mesocorium and endocorium with one or without distinct transverse veins; veins of membrane reticulate toward apex. Abdomen oval, less than one-half wider than pronotum (63 to 45).

Brachypterous form (fig. 58d.2). Pronotum much reduced, about half as long as head, flat; the carinae obsolescent. Scutellum shorter than head (23 to 25), the sides slightly and obtusely elevated, the disc concave. Hemelytra (♂ ♀) a little longer than scutellum; corial veins obsolescent; membrane absent.

♂ (fig. 58b). Fifth ventral segment a little shorter than sixth; genital segment rather short, strongly convex. Length, 5 mm.

♀ (fig. 58a). Posterior margin of dorsal genital segment sinuate, concavely curved at middle; genital lobes irregularly eroded, the tooth and sinus very variable in form. Length, 5.5 to 6.5 mm.

Type specimens (South Carolina) in the Stockholm Museum.

This widely distributed and locally common species is readily recognized by the structure of the antennae, the straight pronotal margins in the macropterous form, and the genital characters. Heidemann (1901) was the first to locate it, subsequently to the original discovery, and later (1904) had specimens from the National Museum collection compared with Stål's types.

59. *Aradus (Quilnus) nigrinus* sp. nov. (Plate VII, fig. 59.)

Description.—Dark grayish brown; antennae black; apical angles of connexival segments obscurely pale; ventral surface dark reddish brown.

Head slightly broader than long (26 to 25), longer than pronotum (25 to 20); tylus short, distinctly narrowed from base to apex; impressions of vertex broad, moderately deep, divergent, indistinctly connected posteriorly; preocular and postocular tubercles obsolete; antenniferous spines extremely short, acute, scarcely divergent, the lateral tooth obsolescent; antennae (fig. 59c) cylindrical, moderately stout, about as long as head and pronotum together, the first segment elongate, reaching anterior fourth of tylus, length of second somewhat less than distance between eyes (15 to 18); rostrum extending a little beyond level of posterior margin of eyes. Pronotum (fig. 59d) moderately convex, lateral margins slightly curved, a little expanded and reflexed, granulate; carinae indistinct, the median pair conjointly elevated and obsolescent in posterior fourth, intermediate pair scarcely developed, lateral pair distinct. Scutellum much longer than head (34 to 25), shaped as in *niger* (fig. 58d.1); sides distinctly elevated; discal elevation low, rounded. Hemelytra (♀) moderately narrowed, exposing most of connexivum at sides, not reaching dorsal genital segment, corium to middle of third segment; exocorium moderately and unevenly expanded at base; mesocorium with one, endocorium without distinct transverse veins; veins of membrane reticulate toward apex.

♂. Unknown.

♀ (fig. 59a). Posterior margin of dorsal genital segment slightly sinuate, almost straight at middle; abdomen rather broadly oval, one-half wider than pronotum (75 to 50). Length, 7.6 mm.

Holotype.—♀; Huachuca Mountains, Arizona, No. 202, Museum of the Brooklyn Institute of Arts and Sciences.

This species is related to *niger*, from which it is distinct in antennal and pronotal structure, larger size, and broader form. It is probable that brachypterous forms will be found, having a different pronotal shape but readily recognized by antennal characters.

60. *Aradus (Quilnus) heidemanni* Bergroth (Plate VII, fig. 60.)

1906. *Aradus Heidemanni* Bergroth, Can. Ent., xxxviii, p. 200.

Distribution.—BRITISH COLUMBIA: Bear Lake, London Hill Mine, VII, 21 (R. P. Currie); Kokanee Mountain, 9000 feet, VIII, 10, 1903 (R. P. Currie); Victoria, Vancouver Island (G. W. Taylor). WASHINGTON: Mount Rainier, Paradise Park, 6000 feet, VII, 15 to 31, 1905 (E. C. Van Dyke). OREGON: Astoria, V, 25, 1902; Dilley. CALIFORNIA: Carville, Trinity County, V, 7, 1913 (E. C. Van Dyke); Mount Hood, 6000 feet, VIII, 19, 1916 (G. P. Engelhardt); Mohave (Calif.?). NEW MEXICO: Cloudcroft. COLORADO: Colorado Springs, VIII to IX (J. E. Jack).

Description.—Dull dark brown to grayish black; membrane sometimes pale.

Head about as long as broad; tylus short, compressed, narrowed toward apex; impressions of vertex rather deep, slightly divergent, connected posteriorly; preocular tubercles small, acute, antenniferous spines acutely conical, moderately divergent, the lateral tooth small or absent; postocular tubercles prominent, rounded; antennae (fig. 60c) moderately slender, cylindrical, about as long as head and pronotum (*f. macrop.*) together, the first segment reaching anterior third of tylus, length of second a little less than distance between eyes (18 to 20); rostrum not quite reaching base of head. Pronotal margins irregularly granulate. Abdomen broadly oval, the margins slightly notched.

Macropterous form, ♂ ♀ (fig. 60d.1). Pronotum moderately convex posteriorly, shorter than head (30 to 25), lateral margins moderately expanded and slightly reflexed, sinuate; carinae distinct. Scutellum longer than head, sides slightly curved, rather strongly elevated; disc flat to base, with a slight central elevation. Hemelytra moderately narrowed, exposing connexivum, (♂) extending to genital lobes, corium to base of fourth segment; (♀) to base or nearly to apex of dorsal genital segment, corium to base of fourth; exocorium moderately expanded at base; mesocorium with one or two, endocorium with one or without distinct transverse veins; veins of membrane somewhat branched toward apex.

Stenopterous form, ♂ (fig. 60d.3). Pronotum reduced, much shorter than head (20 to 30), flattened, depressed posteriorly, lateral margins straight, not expanded; carinae indistinct, except median pair in anterior two-thirds. Scutellum as long as head, the sides obtusely elevated; disc uniformly depressed. Hemelytra greatly narrowed, extending well over genital segment; membrane distinct; hind wings absent.

Brachypterous form, ♀ (fig. 60d 2). Similar to the preceding form except as follows: Hemicylstra abbreviated, shorter than scutellum, the corial veins obsolescent; membrane absent.

♂ (fig. 60b). Fifth ventral segment a little shorter than sixth; genital segment short, moderately convex, the lobes long. Length, 6.75 mm.

♀ (fig. 60a). Posterior margin of dorsal genital segment nearly straight, form of genital lobes somewhat variable. Length, 7.25 to 7.8 mm.

Type specimens (British Columbia and Oregon) in Bergroth's collection, and in the Heidemann collection, Cornell University paratype, No. 251.1.

This is a strikingly distinct species, readily distinguished by its size and antennal structure. It presents all the phases of wing polymorphism found in the genus, and is of especial interest on account of the male dimorphism.

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EXPLANATION OF PLATES

The figures have been drawn with the camera lucida, using the binocular microscope, with several degrees of magnification, but in all cases the antenna and pronotum are drawn to scale. In comparing the figures with specimens, it should be borne in mind that some slight discrepancies are to be expected, owing to variation in detail. The figures of genitalia are so arranged on the plates as to facilitate comparison with specimens placed in the most favorable positions for observation under the usual lighting conditions.

The following letters are used uniformly in connection with the figures of the various species:

- a. Ventral view of the posterior abdominal structures in the female.
- b. The same in the male, usually the terminal portion only.
- c. Antenna.
- d. Pronotum, sometimes with more or less of the neighboring parts.
- e. Dorsal view of the posterior abdominal structures in the female.

The following abbreviations are employed:

- ap. m. Apical margin.
- brach. Brachypterous form.
- d. g. s. Dorsal genital segment.
- en. Endocorium.
- ex. Exocorium.
- g. l. Genital lobe.
- m. Mesocorium.
- macr. Macropterous form.
- x-y. Imaginary line showing level of apical angles of sixth abdominal segment.
- 1g. First genital segment.
- 2g. Second genital segment.
- V. Fifth abdominal segment.
- VI. Sixth abdominal segment.

STUDIES IN THE DERMAPTERA AND ORTHOPTERA
OF COLOMBIA

SECOND PAPER

DERMAPTERA AND ORTHOPTEROUS FAMILIES BLATTIDAE,
MANTIDAE AND PHASMIDAE

BY MORGAN HEBARD

Since our first paper of this series,¹ very important collections have been received from our friends, Hermano Apolinar Maria, of the Instituto de la Salle, at Bogotá, and Mr. M. A. Carriker, Jr., of Santa Marta. As a result, our second paper furnishes additional data on the same sections treated in our first study.

Of the material here considered two collections are of particular importance, in being from two faunal areas virtually unknown from an Orthopterological point of view.

The largest of these is from the border of the Llanos in the Orinoco drainage, at Villavicencio, Intendencia del Meta, 1400 feet, and at Susumuco, Cundinamarca, 2600 feet. The latter locality is apparently not as rich as the former, being at an elevation over a thousand feet higher on the eastern slope of the Eastern Andes. Though Villavicencio is on the edge of the Llanos, the material so far studied would appear to be all, or in large part, from the lower mountain forest, similar to, but probably richer than, the forests about Susumuco. In this series thirty species are here recorded, of which seven are described as new. This material was secured from time to time for Hermano Maria and forwarded to us for study.

The other collection of particular interest was made by Mr. Carriker on a trip through the Colombian Chocó, during the summer of 1918. The material here recorded is from El Tambo, Boca Murindó and Murindó, Intendencia del Chocó, and from Andagoya in that portion of Antioquia which extends into the region known as the Chocó. Of the eighteen species here recorded, five are new to science.

¹ Trans. Am. Ent. Soc., XLV, pp. 89 to 179, (June, 1919).

The correlation of the life zones found in Colombia, the probable channels of distribution, a general discussion of the country and comparison with other regions, from an Orthopterological point of view, will be treated in a later paper of this series. The present time would be premature for any deductions from these preliminary studies of the Dermaptera and Orthoptera of that country, so extensive and intricately diversified.

We have been able to determine the elevation (in feet) for the following localities given in the present paper. Anolaima 5964, Bogotá 8750, Choachi 5900, Cincinnati 4500, Espinal 1000, Fusagasugá 5464, Las Mesitas 3200, Mamatoco 50, Santa Marta 0, Susumuco 2600, Villavicencio 1400.

In this study three hundred and eighty-one specimens are recorded, representing sixty-seven species, of which nineteen are new to science, these including four new genera. Unless otherwise stated this material is in the Hebard Collection at the Academy of Natural Sciences of Philadelphia.

We wish to thank most heartily both Hermano Maria and¹ Mr. Carriker for their aid in our studies of the Orthoptera of Colombia. No such series would have been available for study without the painstaking and long continued effort of these kind friends.

DERMAPTERA

LABIDURIDAE

PSALINAE

Mandex apolinari (Hebard)

1910. *Psalis apolinari* Hebard, Trans. Am. Ent. Soc., xlv, p. 90, pl. xvi, fig. 1. [♀; Pamplona, Santander, Colombia.]

Though noting the probability of generic distinction of this species from *Psalis*, we unfortunately failed, in our first Colombian paper, to remark Burr's proposal of the genus *Mandex*, to include *Anisolabis peruviana* Borinans,² based on characters of the metaparameres.

We are satisfied that *peruviana* and *apolinari* are congeneric, and with the distinctive feature of the metatarsus, which we have described for the latter species, we consider *Mandex* a valid and distinct entity.

² Journ. R. Microsc. Soc., 1915, pp. 524 and 533, (1915).

***Psalis americana* (Beauvois)**

1517 *Forficula americana* Beauvois, Ins. Rec. Afr. Amér., p. 165, Orth., pl. xiv fig. 1 [San Domingo.]

El Tambo, Intendencia del Chocó, IV, 5, 1918, (M. A. Carriker, Jr.), 1 ♂, 1 large juv. ♂, 1 medium juv.

The adult before us agrees fully with Panamanian individuals of this species which we have recorded, of the large winged type, showing over half of the tegmina occupied by a broad transverse orange band.

***Spandex rosenbergi* (Burr)**

1899. *Psalis rosenbergi* Burr, Ann. Mag. Nat. Hist., (7), iv, p. 253 [♂, ♀; Paramba, Chimbo and Cachabé, Ecuador.]

El Tambo, Intendencia del Chocó, IV, 5, 1918, (M. A. Carriker, Jr.), 1 ♂.

Burr's generic assignment of this species is, in our opinion, fully warranted. One of the most distinctive features of *Spandex* has, however, never been noted. This character, is that in the male subgenital plate a small but sharp emargination occurs mesad on the distal margin, a very small agglutinated tuft of hairs on each side springing from poorly defined sockets on the apices of the lateral portions thus formed. Hasty examination of this feature would cause one to suppose that reduced styles were present. In no other genus of American Dermaptera is an analogous development found.

Burr has chosen *Psalis pulchra* Rehn as genotype of *Spandex*.² No reason is given for resurrecting this name, which we find to be a synonym of *Forficula percheron* (Guerin and Percheron), as had been previously indicated by Burr. The genotype of *Spandex* is, in consequence, *percheron*.

We place *rosenbergi* in this genus without hesitation, to which *huenschii* (Burr) also apparently belongs. Burr's tentative assignment of *Psalis festiva* Burr to *Spandex* we believe to be incorrect, as material from Venezuela referable to that species, in the Philadelphia Collections, is properly assignable to *Psalis*. The other species tentatively assigned to *Spandex* by Burr, *Psalis nigra* Caudell, we do not know.

The specimen here recorded, compared with Burr's description of *rosenbergi*, differs in features which appear to be due rather

² Journ. R. Microsc. Soc., 1915, p. 524, (1915).

to descriptive inaccuracy than to real differences of importance. Thus the anal segment is scarcely "medio valde quadrato-emarginatum," but similar to that of *percheron* and best characterized as showing, between the bases of the forceps, a transverse depression. "Pygidio nullo" is of course incorrect, this portion being as in *percheron*, while the subgenital plate is as described above rather than "medio apice sulcata."

The present male is readily distinguished from a pair of *percheron* before us, from Trinidad, in the Philadelphia Collections, by the head being as dark as the pronotum; the heavier, slightly more hairy and slightly lighter brown abdomen with lateral angles of distal abdominal tergites sharper and distinctly keeled; anal tergite medio-longitudinally carinate distad, toward the forceps with sculpturing of dorsal surface more pronounced, and buffy limbs with femora all showing a single broad and dark annulus.

ORTHOPTERA

BLATTIDAE

ECTOBIINAE

ASEMOBLATTA⁴ new genus

The only known species of this genus has the general appearance of a rather short winged species belonging to, or near, the genus *Cariblatta*. Examination, however, shows it, in our opinion, to be a member of the Ectobiinae.

The head is very short, forming approximately an equilateral triangle. In this feature close agreement with the Ectobiine genus *Lissoblatta* is shown, but also similarity to the Oxyhaloid genus *Chorisoneura*. The head is of an entirely different structure in all forms of the Pseudomopinae of the Group Blattellae, where this insect would necessarily be assigned in that subfamily. The armament of the limbs is weak, the ventro-cephalic margins of the cephalic femora supplied with a row of minute piliform spines, these features of apparently no assistance in placing this insect. The pronotum is strongly transverse caudad, thus showing a type frequent in the Group Blattellae of the Pseudomopinae, rare in the Ectobiinae. The somewhat reduced tegmina have

⁴ From ἄσημος = insignificant, or without device.

the discoidal and median veins parallel and alone distinct, with branches of the latter (discoidal sectors) oblique. This agrees with one of the more usual types of tegminal venation in the Ectobiinae, but where tegminal reduction has occurred in certain Pseudomopids (such as is found in certain species of the genus *Latiblattella*) the results are practically the same as here shown. The male supra-anal plate is well produced, this of little significance except that a large number of Ectobiid species have this plate strongly transverse. The short fourth joint of the tarsi is alone supplied with a pulvillus, which occupies its entire ventral surface. The tarsal claws are asymmetrical and unspecialized, a condition frequent in Ectobiids, but also of a type developed in those Pseudomopids to which this insect might be supposed to show nearest affinity.

Careful consideration of the evidence convinces us that, though aberrant in some features, the insect is a member of the Ectobiinae. We consider the genus nearest *Lissoblatta*, differing in the broader head with much broader interocular space, distinctive pronotum, which is proportionately much larger with caudal margin transverse, vestigial wings, much shorter and heavier cerci and more Plectopterine male genitalia.

The genus is monotypic. *Genotype*.—*Asemoblatta nana* new species.

Generic Description. Size moderately large for this group of very small roaches; form very stout, elliptical, surface smooth and shining. Head triangular, very slightly longer than broad, interocular space very wide, ocellar areas very poorly defined, ocellar spots very weak. Pronotum relatively large, showing a weak transverse depressed area meso-cephalad, broad caudal margin transverse, truncate, disk distinctly octagonal in outline. Tegmina in form and general type of venation much resembling the type developed in *Lissoblatta*, broad, costal margin convex to the well rounded apex, discoidal sectors oblique. Wings represented by atrophied pads. Dorsal surface of male abdomen conspicuously specialized. Male cerci very short and heavy, much shorter and heavier than in *Lissoblatta* and *Anaplecta*. Male supra-anal plate produced, even more so than in *Lissoblatta*. Male subgenital plate and appendages specialized, of a Plectopteroid type. Cephalic femora, as in *Lissoblatta*, with ventro-

cephalic margin armed with a long row of closely placed, short, microscopic, piliform spines, terminating in two elongate distal spines, of which the more distal is slightly the longer; ventro-caudal margin supplied with an elongate spine distad. Median and caudal femora supplied on all ventral margins with elongate hairs and a single elongate distal spine (and in addition from none to one elongate spines). Caudal tarsi with fourth joint alone supplied with a pulvillus, which occupies its entire ventral surface. Tarsal claws asymmetrical, unspecialized. Arolia very large. In these three latter features agreeing with *Lissoblatta*, but also with *Chorisoneura*.

Asemoblatta nana new species (Plate VIII, figs. 1 to 3; plate X, figure 28.)

The affinities of this diminutive and anomalous species are discussed under the generic treatment.

Type.—♂; Bogotá, Cundinamarca, Colombia. Elevation, 8750 feet. November 24, 1914. (From A. Maria.) [Hebard Collection, Type no. 542.]

In addition to the features given in the generic discussion, we would add the following. Interocular space slightly wider than that between the antennal sockets. Maxillary palpi with enlarged fifth (distal) joint subequal in length to fourth, longer than third. Pronotum with cephalic margin evenly convex to the latero-caudal angles.

Tegmina slightly reduced, reaching to base of supra-anal plate,⁵ anal sulcus very inconspicuous, (nine) costal veins well spaced, without intervening spurious veinlets, delicate discoidal sectors oblique (three in sinistral tegmen; none in dextral tegmen, which area is concealed when the tegmina are at rest). Wings atrophied, represented by elongate-oval lateral pads, extending slightly beyond caudal margin of metanotum, showing only a heavy, bifurcated discoidal vein. Sixth tergite highly specialized mesad,⁶ in a large depression there found a transversely convex ridge occurs with cephalic face supplied with a tuft of agglutinated hairs directed cephalad.

Supra-anal plate triangular with apex bluntly rounded, in length two-thirds proximal width. Subgenital plate Plectopteroid, with two heavy, cylindrical, convergent styles, situated in deeply inset sockets, these styles about twice as long as wide with apices tapering, the sinistral thickened throughout, slightly shorter and heavier in distal half than the dextral. The median section of the subgenital plate is narrowly triangularly produced, directed obliquely dextrad and pressed between these styles.

⁵ So called generally in descriptions of the Blattidae, it is actually the ninth tergite; the tenth, or true supra-anal plate disappears in this family before the adult condition is reached.

⁶ Of the same type as in *Lissoblatta*, but more decidedly developed.

Head prout's brown. Limbs and underparts buckthorn brown, except laterad on abdomen where the coloration is much darker, broadly blackish brown latero-proximal. Lateral margins of pronotum and tegmina transparent, tinged with buckthorn brown. Disk of pronotum prout's brown, with a few flecks of darker coloration. Mesonotum, metanotum and median segment cinnamon brown. Abdomen, to sixth tergite, blackish brown, with paired transverse median blotches of cinnamon brown on each segment, which decrease in size caudad, remaining entire distal portion of dorsal surface of abdomen cinnamon brown, except proximal portion of sixth tergite, which is blackish brown.

Length of body, 7; length of pronotum, 2; width of pronotum, 2.9; length of tegmen, 5.7; greatest tegminal width, 2.2; length of caudal tibia, 2.7 mm.

The type of this remarkable species is unique.

PSEUDOMOPINAE.

Chromatonotus andagoyae new species (Plate VIII, figures 4 and 5; plate IX, figure 17.)

The present species is closely related to *C. notatus* (Bruner), with a large series of which species from Trinidad, in the Philadelphia Collections, we have compared it.

Superficially *andagoyae* is seen to be somewhat larger, with pronotal discal marking weaker but similar in position, while the tegmina are not darkened along the humeral trunk and the wings have the area of the enlarged portion of the costal veins dark and unicolorous.

The male genitalia are very distinctive, the highest specialization occurring in the paired plates beneath the supra-anal plate, as is true of the other species of the genus.

Type.—♂; Andagoya, Antioquia, Colombia. April 22, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 539.]

In addition to the generic characters recently given,⁷ we would note the following.

Size slightly larger than *notatus*, hence the largest known species of the genus. Interocular width three-quarters that between the large and conspicuous ocellar spots, distinctly less than length of first antennal joint. Enlarged fifth (distal) joint of maxillary palpus intermediate in length between that of third and fourth joints. Wing with width of anterior field slightly over one-fifth its length.

Supra-anal plate weakly transverse, length slightly over three-quarters proximal width, free margins rather strongly convex to meso-distal portion,

⁷ Hebard, Mem. Am. Ent. Soc. no. 4, p. 45, (1920). Though the dorsal surface of the male abdomen would appear to be best termed unspecialized in the species of this genus, the median segment is supplied with hairs in a transverse area, these hairs becoming thickly placed mesad.

where mesad a very slight, broadly obtuse-angulate emargination is apparent. Cerci small, elongate and slender, the twelve joints with sutures well marked, the lateral margins of the joints nearly straight, but each (from the sixth to eleventh) distinctly narrower than its predecessor; dorsal surface flat; ventral surface of each joint strongly convex, with very narrowly cingulate lateral margins. Paired plate beneath supra-anal plate highly specialized; sinistral half chitinous, flattened against wall of anal orifice, with a moderately stout process below base of sinistral cercus directed caudad, this process dividing into two slender branches distad, the ventral of which is twice the length of the dorsal and very slightly thickened and de-curved distad. Dextral half of this plate developed into a large chitinous ridge, from which extends ventro-sinistral a process which is heavy in proximal three-fifths, but from that point is slender, tapering gradually to its acute apex, this process showing a weak curvature dorsad, its ventral margin armed with a few irregularly placed teeth. Subgenital plate supplied with elongate scattered hairs, rather strongly convex except in distal area between the styles, where it is flattened and slopes to the free margin. Free margin of subgenital plate convex to each of the styles, showing emargination toward the bases of each of these. Sinistral style minute, straight, simple, cylindrical, feebly tapering to its sharply rounded apex, nearly four times as long as its basal width. Dextral style half as large, its dorsal surface armed with four minute teeth directed caudad, the basal one of which is dextrad of the line formed by the others. Exposed ventro-lateral portions of eighth tergite, which are folded over the lateral portions of the subgenital plate, large, extending nearly as far caudad as the subgenital plate itself.

Head blackish chestnut brown; ocellar spots, proximal antennal joints, palpi and mouthparts buffy, remaining portions of antennae chestnut brown. Limbs buffy, with spines slightly darker, except portions of the coxae, and cephalic femora at base, which are suffused with blackish. Abdomen above and below, ochraceous-tawny mesad, shading to chestnut brown laterad, with margins cinnamon-buff. Cerci chestnut brown. Pronotum dull ochraceous-orange, the caudal margin chestnut brown, the maculation running cephalad from the humeral angles as a weaker suffusion of cinnamon-brown to the cephalic portion of the disk, where these darker areas broaden toward each other, reuniting to form a vague transverse cinnamon-brown band, intensifying mesad on each side, so that twin blotches of chestnut brown are formed. Tegmina transparent, richly tinged with antique brown, except toward the costal margin, which is broadly buffy, the one coloration shading gently into the other. Wings transparent, very weakly tinged with prout's brown, this very heavy in entire area of costal veins.⁸

Length of body, 11.3; length of pronotum, 3; width of pronotum, 3.9; length of tegmen, 11.7; width of tegmen, 3.3 mm.

The type is unique.

⁸ In this feature *andagoyae* agrees with *C. lamprus* Hebard, described from Panama. In *notatus* the area of the costal veins is heavily tinged with prout's brown to near the free margin, the narrow marginal portion being buffy.

SCIABLATTA ⁹

This genus is nearest *Rhytidometopum*, differing in the larger size, broad form, uniform and pale coloration, moderately broad and unspecialized interocular space, broader tegmina, wings with weakly clubbed costal veins and different type of male genitalic specialization.

The pale immaculate coloration suggests the more usual type in *Neoblattella* and, to a lesser degree, certain species of *Latiblattella*.

The form is broad, more nearly as in *Platylestes* and the broader species of *Latiblattella*, and in fact the general superficial appearance suggests a longer winged species near *Latiblattella parvida* (Rehn).

The genus is monotypic. *Genotype*.—*Sciablatta mamatoco* new species.

Generic Description. Sexes similar, with tegmina and wings fully developed. Size medium large for the Group Blattellae, form broad for the group. Tegmina very delicate, with discoidal sectors oblique. Wings with costal veins weakly clubbed, ulnar vein with few branches, intercalated triangle present. Dorsal surface of male abdomen specialized. Cerci very elongate and slender. Subgenital plate of male fused and specialized with the lamellate styles. Subgenital plate of female full, showing no distal cleft or emargination. Ventro-cephalic margin of cephalic femora with a row of spines which decrease gradually in length distad, terminating in three heavy distal spines. Ventro caudal margin of cephalic femora armed with (three or four and one distal) spines. Moderately well developed pulvilli present on four proximal tarsal joints. Tarsal claws symmetrical and unspecialized. Arolia present.

Sciablatta mamatoco new species (Plate VIII, figures 6 and 7.)

The combination of characters given in the generic diagnosis shows that this species is widely distinct from all previously known forms, showing nearest affinity to species having a very different general appearance.

⁹ From σκιά = shadow.

Type.—♂; Mamatoco,¹⁰ Magdalena, Colombia. Elevation, 50 feet. December, 1917. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 538.]

In addition to the generic features already given, we would note the following for the present species. Interocular space four-fifths that between the antennal sockets. Inter-ocular-ocellar area flattened. Ocellar spots large, their areas showing no defining contour. Lateral margins of cheeks weakly convergent ventrad. Maxillary palpi missing. Tegmina with numerous discoidal sectors (twelve to thirteen). Wings with (eight to ten, the variation caused by distal branching) complete branches of the ulnar vein. Fifth tergite with broad median section shallowly concave; sixth with broad median section slightly more deeply concave, with a slightly raised medio-longitudinal V-shaped area, its lateral margins slightly convex and thickly supplied with agglutinated hairs directed caudad, the caudal margin subchitinous and weakly and broadly emarginate mesad; seventh and eighth tergites transversely narrower, exposed very narrowly along their caudal margins.

Supra-anal plate triangular with apex broadly rounded, its length two-fifths its basal width. Cerci slender and elongate, tapering to acute apex, the joints (thirteen in allotype, damaged in type) well defined, the lateral margin of each nearly straight, the dorsal surface weakly convex, the ventral surface decidedly convex between the narrowly lamellate lateral margins. Paired plate beneath supra-anal plate large and unspecialized. Titillator with chitinous distal portion short and heavy, terminating in a sharp decurved point. Subgenital plate with proximal portion very weakly convex. Latero-distal portions slanting sharply upward, their dorsal margins weakly sinuous, transverse to the styles. The latter are represented by lamellate plates, moderately convex externally, broadly hinged to the lateral portions of the subgenital plate, vertical and directed caudad, slightly deeper than long, with free margins convex, particularly distad. The brief median portion of the free margin of the subgenital plate between these is triangularly produced dorsad, its distal portion slender, slightly thickened and curved caudad, with apex sharp but unarmed, this portion with height equal to its basal width.

Caudal metatarsus supplied with a large rounded distal pulvillus, succeeding three joints with ventral surfaces fully occupied by large pulvilli (from immature example, caudal metatarsi missing in type and allotype).

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees fully with male in most ambisexual features, differing in the following respects. Size larger; tegmina and wings fully developed in similar proportion. Interocular space very slightly wider. Inter-ocular-ocellar area slightly less decidedly flattened. Dorsal surface of abdomen unspecialized. Supra-anal plate one-third as long as basal width, triangular but bilobate at apex, this due to a short medio-longitudinal distal cleft, which

¹⁰ This locality is four and one-half miles from Santa Marta, in the arid coastal region.

is not complete, the chitinous margins being connected by soft integument. Subgenital plate ample, scoop-shaped, not strongly produced, free margins convex, except at bases of cerci, where moderate emargination is found.

Coloration generally similar in the sexes. Antimony yellow, in the female showing a slightly more ochraceous tinge. Disk of pronotum with a very weakly defined pair of slightly darker median flecks. Tegmina nearly transparent, with veins and numerous transverse veinlets pale buffy, the intervening minute areas tinged with the general coloration; so that the tegmina, under high magnification, are seen to be delicately and minutely tessellate. Wings transparent, very faintly tinged with buffy, this very slightly stronger in area of costal veins. The deepest coloration is on the dorsal surface of the abdomen, which is antimony yellow, washed with ochraceous orange.

Length of body, ♂ 12, ♀ 13.5; length of pronotum, ♂ 3.3, ♀ 4; width of pronotum, ♂ 4.8, ♀ 5.8; length of tegmen, ♂ 13.7, ♀ 15.2; greatest width of tegmen, ♂ 4.3, ♀ 4.9 mm.

In addition to the described pair, a female, in the last instar preceding maturity, bearing the same data, is before us.

Neoblattella albida (Saussure)

1869. *Blatta albida* Saussure, Rev. et Mag. de Zool., (2), xxi, p. 110. [♂, Bogotá, [Colombia].]

Bogotá, Cundinamarca, XI, 24, 1914, (from A. Maria), 1 juv. ♀.

This immature example would appear to represent the present species, described from the same locality. Until the type is analyzed or more material is seen from that region, the exact position of *albida* remains in doubt.

Neoblattella antioquiae new species (Plate VIII, figure 8.)

The present insect is a member of the Impar Group of the genus. It is apparently closely related to *N. albida* (Saussure), differing in features of coloration, but particularly in the very high and intricate specialization of the male subgenital plate.

As in *albida*, the distal cross-veinlets of the tegmina are strikingly darkened.

Type.—♂, Andagoya, Antioquia, Colombia. April 22, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 543.]

Size large for the Impar Group, form rather slender. Interocular space four-fifths as wide as that between the antennal sockets, ocellar spots weakly defined. Maxillary palpi very elongate, fifth joint three times as long as greatest width, three-quarters as long as fourth joint, which is slightly shorter than the very slender third joint. Pronotum as in *N. acanthostylata* Hebard, as characteristic of the Impar Group.

Tegmina delicate, with (seven sinistral, six dextral) longitudinal discoidal sectors, cross-veinlets decided and strikingly colored distad and in area of dextral tegmen concealed when at rest. Wings delicate, proximal (seven) costal veins heavily clubbed distad, this and the coloration of this area as described for *albida*, ulnar vein with (five) complete branches, intercalated triangle small. Abdomen with dorsal surface unspecialized, except that the sixth tergite bears mesad a few scattered, microscopic hairs.

Supra-anal plate transverse, with free margins straight and nearly transverse, weakly oblique to less than median third, where the plate is produced in a moderately deflexed area, twice as wide as long, with brief lateral margins straight but rounding without angulation into the broadly convex caudal margin. Paired plates beneath supra-anal plate unspecialized. Cerci elongate and slender. Subgenital plate with sinistral portion straight, curled briefly upward, its margin straight, oblique, at the apex of the channel thus formed is situated an elongate, slender, flattened process (probably the sinistral style), over three times as long as its basal width, directed in the same line and consequently meso-distad, tapering from its proximal quarter to the sharply rounded apex and decurved in distal fourth. Adjacent to this dextrad is a similar process (probably the dextral style), springing from an almost obliterated socket, slightly more elongate, bearing in the same direction proximad but curving sinistrad in the distal portion, so that the apex is above but beyond that of the sinistral process, these two processes have their dorsal surfaces proximad armed with rather closely placed, erect, microscopic, conical teeth. Adjacent to these processes dextrad is a third, very slender process, slightly the shortest of the three, cylindrical but somewhat irregular in contour, unarmed, straight and directed more strongly dextrad than the others. From this process the free margin of the plate is feebly concave, moderately oblique to the dextral section of the plate. Dextral section of subgenital plate with lateral margin straight to beyond cercal base, in this portion sharply folding inward at the margin and forming a lamellation with dorsal surface very strongly concave, thus embracing the proximal portion of the dextral style. So complex is the subgenital plate that reference to plate VIII, figure 8, is recommended.

Limbs and armament as in *acanthastylata*¹¹ (except that the flange of the tarsal claws is armed with seven teeth, though the three more distal ones are the more conspicuous).

General coloration buffy, tinged with tawny olive. Head of this coloration with four transverse suffused bands of darker brown, the heaviest between the ventral margins of the eyes, the next between the dorsal margins of the ocellar spots, the next between the ventral margins of the ocellar spots and the last very weakly indicated above the clypeus, the three last broken mesad. Pronotum with disk ochraceous-buff, pictured with delicate lines, and a blotch later-caudad on each side, of cinnamon brown and dots of deep mars brown; marginal portions hyaline with a faint buffy tinge. Tegmina and wings hyaline, cross-veinlets of tegmina distad heavily suffused with prout's brown; veins, spurious veins and cross-veinlets in area of dextral tegmen,

¹¹ Mem. Am. Ent. Soc., no. 4, p. 55, (1920).

concealed when at rest, heavily tinged with prout's brown. Wings transparent, tinged with prout's brown. except in narrow area between bases of costal veins which is solidly prouts brown, as are the clubbed apices of the same, which area is paler as described for *albida*. Dorsal surface of abdomen blackish brown, shading to buckthorn brown proximad, with broad mesoproximal area of each tergite buckthorn brown; the supra-anal plate buckthorn brown, suffused with blackish brown in median section of produced portion and heavily but narrowly above the cercal bases. Limbs ochraceous-buff, with dorsal surface of cephalic femora suffused with cinnamon brown and flecks of very dark brown at the bases of the spines. Cerci ochraceous-buff, dorsad with extreme tip blackish, ventrad with median sections of the five largest joints suffused with blackish brown.

Length of body, 12.5; length of pronotum, 3.2; width of pronotum, 4; length of tegmen, 13; width of tegmen, 3.9 mm.

The type is unique.

***Blattella germanica* (Linnaeus)**

1767. [*Blatta*] *germanica* Linnaeus, Syst. Nat., ed. XII, p. 668. [Denmark.]

Bogotá, Cundinamarca, 1 ♀, [U. S. N. M.].

***Ischnoptera morio* Burmeister**

1838. *Ischnoptera morio* Burmeister, Handb. Ent., II, abth. II, pt. I, p. 500. [Colombia.]

Susumuco, Cundinamarca, V, 1919, (from A. Maria), 1 ♀.

Villavicencio, Intendencia del Meta, XII, 1918, (from A. Maria),

1 ♀.

***Ischnoptera apolinari* Hebard**

1919. *Ischnoptera apolinari* Hebard, Trans. Am. Ent. Soc., XLV, p. 102, pl. XVI, figs. 6 and 7. [♂, ♀; Choachi, Cundinamarca, Colombia.]

A topotypic series of one male and four females, taken in June, 1917, has been subsequently received from Hermano Apolinar Maria.

***Ischnoptera flagellifer*¹² new species (Plate VIII, figures 9 and 10.)**

The present species shows close relationship to the Panamanian *I. gatunae* Hebard, agreeing fully in size, form, coloration and in fact all diagnostic features, excepting the very highly specialized and distinctive genitalia.

Type.—♂: Andagoya, Antioquia, Colombia. April 22, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 544.]

¹² In allusion to the remarkable flagellate process, developed in the male genitalia of this species.

Size medium large, form slender. Interocular space narrow, about one-third as wide as that between antennal sockets, four-fifths as wide as interocular space. Ocelli large and distinct, flattened surfaces of ocellar areas forming a moderately sharp angle with interocular area. Maxillary palpi moderately short; fifth joint very slight longer than third. Latero-caudal sulci of pronotal disk pronounced.

Tegmina and wings extending beyond apex of abdomen nearly one and one-half times cercal length. Tegmina elongate and narrow, with portion of dextral tegmen, concealed when at rest, transparent, though slightly suffused. Dorsal surface of abdomen specialized as is characteristic of the genus.¹³

Supra-anal plate trapeziform produced, with latero-caudal angles broadly rounded and margin between weakly concave, all but the margins of the large produced portion weakly chitinous; subchitinous in a small meso-proximal area, just caudad of which the ventral surface of the plate is produced in a small rounded subconical projection, this projection about half as high as its basal width and crowned with a tuft of stout bristles, which are two-thirds as long as the proximal width of the projection; margins of plate fringed along the ventral surface with similar but shorter bristles and with a cluster of minute spines near the base of the dextral cercus.¹⁴ Paired plates beneath supra-anal plate highly specialized; sinistral plate large, transverse, produced medio-longitudinally in an elongate, convex ridge, this plate armed dorso-proximad with a patch of minute but stout, short, sharp spines; dextral plate large, transverse, with caudal surface convex, the ventral portion thickened, rounded, its ventral surface armed distad with a large patch of minute but stout, short, sharp spines. At basal segment of sinistral cercus with an elongate flagelliform process, developed from its internal face, this slenderly cylindrical, chitinous, curving across beneath the supra-anal plate to the median line, there curving downward and finally curved caudad before its acute apex. At basal segment of dextral cercus with a heavy and much shorter flattened process directed sinistrad, then bent at its median point ventro-sinistrad, the distal half slenderly lanceolate, straight, with apex acute.¹⁵ Subgenital plate hairy, strongly asymmetrical, surface convex except in produced portion, where it is moderately concave; with lateral portions vertical, the free margins thickened and curling narrowly inward proximad; dextral portion of free margin broadly convex to median third of plate, which is weakly convex, then nearly transverse to sinistral third, which section is moderately concave; at the weakly defined apex is

¹³ Described in Mem. Am. Ent. Soc. no. 2, p. 62, (1917).

¹⁴ Examination of the type shows that this also occurs in *gatusae*.

¹⁵ In *gatusae* the concealed genitalia are developed in the same general manner, but the dorso-sinistral projection is very much shorter, the patch of spines on the sinistral plate is larger and situated meso-distad, while the much higher specialization of the supra-anal plate causes the dextral plate to be very much smaller, no patch of spines occurring on this plate.

situated a heavy style (dextral), bent strongly sinistral from its base, about twice as long as the short, straight portion of its sinistral margin, tapering slightly to its rounded apex which is armed dorsad with minute teeth, immediately beyond the point opposite the apex of this style on the margin a (sinistral) style of half the bulk springs erect, straight, with more sharply rounded apex similarly armed; a brief distance dextrad of the heavier style springs another process, with base slightly thicker than its cylindrical shaft, nearly eight times as long as its median width or three times as long as the smaller style, erect, nearly straight, curving weakly caudad, with rounded apex armed dorsad with minute teeth.¹⁵

Limbs and armament of same as characteristic of the genus.

Head dark chestnut brown, ocelli light buff. Antennae, including first joint, mummy brown. Mouthparts, maxillary palpi, limbs and ventral surface of abdomen ochraceous-buff, the latter strongly tinged with cinnamon brown. Pronotum with disk heavily suffused with cinnamon brown in a vague pattern; lateral portions ochraceous-buff, this narrowly invading the disk cephalad of the latero-caudal sulci; caudal portions transparent. Tegmina translucent, dresden brown, the marginal field paler. Wings transparent, area between costal veins dark chestnut brown, shading to cinnamon brown toward the free margin and in the entire distal portion beyond the humeral vein, colorless between the dark chestnut brown principal veins. Dorsal surface of abdomen buckthorn brown, suffused laterad with prout's brown. Cerci prout's brown.

Length of body, 14.2; length of pronotum, 3.3; width of pronotum, 4.6; length of tegmen, 14.8; width of tegmen, 4 mm.

The type is unique.

Ischnoptera implicata new species (Plate VIII, figure 11.)

The present species is extremely close to the Peruvian *I. angustifrons* Hebard, being readily distinguishable only by the different development of the male genitalia within the anal chamber. In other respects, when compared with the male type of *angustifrons*, the unique male of *implicata* is seen to differ only in the considerably more slender form, very slightly wider interocular space, less ample pronotum showing the latero-caudal sulci of the disk more decided, supra-anal plate with more extensive subchitinous area, and minor differences of coloration.

Type.—♂; Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. June, 1918. (From A. Maria.) [Hebard Collection, Type no. 548.]

¹⁵ This process has the appearance of a third style and is a feature we have not noted in any other species of *Ischnoptera*, though the subgenital plate of *Neobathella antioquiae*, here described, shows a somewhat analogous development.

Size large for the genus, form decidedly slender, more slender than in *I. vulpina* Hebard. Head with interocular space very narrow, its width slightly over one-quarter of a millimeter, half as wide as interocellar space and appreciably wider than in *angustifrons*. Ocelli and maxillary palpi as here described for *flagellifer*. Pronotum narrower than in *angustifrons*, much as in *flagellifer*, with latero-caudal sulci of disk pronounced.

Tegmina and wings decidedly elongate, slightly more elongate and slender than in *angustifrons*, venation as characteristic of the genus, as is the specialization of the dorsal surface of the abdomen.

Supra-anal plate broadly trapeziform produced with lateral portions convex, chitinous, curving moderately ventrad, the large median portion not as much raised, subchitinous, rectangulate, with length slightly greater than breadth, the distal free margin transverse. This plate bears on its ventral surface sinistro-proximad a marginal ridge armed with moderately elongate chaetiform spines, a fringe of similar spines being also present proximad along the ventral surface of the dextral margin.¹⁷ Paired plates beneath supra-anal plate at basal segment of sinistral cercus produced dextrad in an elongate heavy process, which tapers evenly to the acute apex, its dorsal surface subchitinous,¹⁸ sinistral plate below this moderately large and unarmed in visible portions.¹⁹ Plate at base of dextral cercus, as described below, similar to homologous sinistral plate, but somewhat heavier and entirely chitinous²⁰; dextral plate developed into four digits, the first and ventral developed into an elongate cylindrical clubbed process with apex armed with short sharp teeth, above this a very slender chitinous flagelliform process which curves ventrad across the surface of the remaining section of the plate, this latter portion produced dorso-mesad in a heavy clubbed process with apex armed with short sharp teeth, the dorsal margin of this portion deeply concave between the two clubbed processes and thus accomodating the flagelliform process²¹; above these the plate surrounds the cercal base as

¹⁷ In *angustifrons* the ventral surface of the supra-anal plate is supplied proximo-laterad with similar chaetiform spines, meso-sinistral in the area of least chitinization with a heavy tuft of similar spines, directed caudad and slightly dextrad of the median line, with a weak irregular ridge distad bearing a moderate number of similar spines.

¹⁸ In *angustifrons* the homologous process is smaller and bears a large sharp spine dorsad at end of proximal two-thirds, while from the soft integument above projects a delicate but chitinous, curved spine.

¹⁹ In *angustifrons* much larger, with a few heavy teeth meso-dorsad.

²⁰ In *angustifrons* this process is forked, the lower portion heavy and rounded, bearing a distal spine, the upper portion irregularly curving dorso-dextrad, then caudad, then dextrad, tapering so that it is very slender in distal half, with apex acute.

²¹ In *angustifrons* this plate is largely concealed, but apparently is not developed into armed processes.

a heavy base to an elongate process, tapering evenly to its aciculate apex, weakly curving and directed meso-dorsad. Titillator with distal portion very slender and dorsal armament weak.²² Subgenital plate convex except meso-distad where it is weakly concave and weakly triangularly produced. At the apex of this production is situated a cylindrical style, over three times as long as its median width, directed dorso-sinistrad, its base stout, its shaft cylindrical, with blunt apex covered with minute, short, stout spines. Sinistrad of this style is situated a small cylindrical style with unarmed apex rounded, slightly over half as long and distant from the larger style slightly over its own length. Subgenital plate with free margin dextrad decidedly convex to base of mesal production, where, with the almost straight, oblique dextral margin of this production, a distinct and broadly rounded concavity is formed; from the apex of the mesal production the sinistral portion of the free margin is nearly straight and oblique to the base of the plate.

Limbs as characteristic of genus

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with male except in the following respects. Size larger, form slightly more robust, much as in males of *rulpina*. Interocular space as broad as interocellar space. Tegmina and wings proportionately scarcely shorter than in male, extending beyond the cercal apices over twice the cercal length. Dorsal surface of abdomen unspecialized. Supra-anal plate strongly produced mesad, half as long as proximal width, the lateral margins concave, particularly proximad, the apex broadly rounded, projecting well beyond the caudal margin of the subgenital plate. Subgenital plate decidedly transverse, convex, with free margin evenly and broadly convex.

Head to ventral margins of ocelli shining blackish brown, there shading to cinnamon rufous with last two joints of maxillary palpi suffused with blackish brown, ocelli buffy. Pronotum tawny, very faintly paler laterad and cephalad. Tegmina translucent tawny, a shade darker than in *angustifrons*, the marginal field ochraceous-buff. Limbs and underparts ochraceous-buff, weakly tinged distad with cinnamon brown, the spines russet.²³ Dorsal surface of abdomen cinnamon brown, the subchitinous section of the male supra-anal plate paler.

In three females the latero-caudal sulci of the pronotal disk are suffused with slightly darker brown. All have the subgenital plate showing, to different degrees, a suffusion of blackish brown mesad along the caudal margin.

²² In *angustifrons* the distal portion of the titillator is much broader and more heavily armed, much as shown in Mem. Am. Ent. Soc., no. 4, pl. iv, fig. 8, (1920).

²³ In *angustifrons* the limbs are ochraceous-buff weakly tinged with tawny distad, the spines tawny.

Length of body, ♂ 15.5, ♀²⁴ 15.8, 15.7–15.8; length of pronotum, ♂ 3.6, ♀ 4.1, 4–4.1; width of pronotum, ♂ 4.5, ♀ 5.4, 5–5.2; length of tegmen, ♂ 17.3, ♀ 19.8, 17–17.9; width of tegmen, ♂ 4.4,²⁵ ♀ 5, 4.9–4.9; length of caudal femur, ♂ 6.7, ♀ 7, 6.1–6.7 mm.

In addition to the described pair, three female paratypes, bearing the same data, are before us.

Xestoblatta poecila new species (Plate IX, figure 18.)

The present species is the most strikingly colored form of the genus *Xestoblatta* which we have seen. The coloration, and particularly that of the pronotum, is distinctive. The species is apparently more nearly related to *X. nyctiboroides* (Rehn) than to the other species at hand. Discovery of the male sex is awaited with interest.

Type.—♀: Villavicencio, Intendencia del Meta, (Colombia. Elevation, 1400 feet. December, 1918. (From A. Maria). [Hebard (Collection, Type no. 545.)]

Size medium for the genus, form robust. Interocular space (1.2 mm) four-fifths as wide as that between the antennal sockets. Ocellar areas weakly defined, but the convexity at their inner margins stronger than is usual in the genus. Pronotum as characteristic of *Xestoblatta*.

Tegmina and wings reaching beyond apex of abdomen a distance equal to the length of the caudal tarsal joints, with venation as characteristic of the genus. Wings with (five) complete and (four) incomplete branches of the ulnar vein. Abdomen with fourth, fifth and sixth tergites with latero-caudal angles acute-angulate produced caudad.

Supra-anal plate half as long as proximal width, triangularly produced between the cerci, with lateral margins rather decidedly concave and apex rounded. Subgenital plate little produced, with surface broadly convex; free margin evenly and rather broadly convex, showing weak flattening of this convexity beneath the cerci, with margin distad thickened, so as to cause an upper rim, but not briefly curled upward and inward.

Limbs as characteristic of the genus.²⁶

²⁴ For the females the allotype is given first, then the extremes in the paratypes.

²⁵ Distad 4.5, in *angustifrons* 4.7 mm.

²⁶ Described, Trans. Am. Ent. Soc., XLII, p. 370, (1916). The pulvilli and arolia have not been described for *Xestoblatta*. The three proximal tarsal joints are each supplied ventrad with a biseriate row of minute spines and distad with a large pulvillus, as broad as long with apex rounded, the short fourth joint with ventral surface fully occupied by a similar pulvillus. Arolia well developed between the simple, symmetrical tarsal claws.

Head with occiput and a vertical median band on face of shining blackish brown, the latter narrowest above the clypeus; lateral portions of face light ochraceous-buff, this lightly invading the band at the ocellar spots. Pronotum shining blackish brown, except for a moderately broad and sharply defined band of warm buff, which runs around the lateral and cephalic margins and is slightly widest caudad and a large, meso-caudal, bluntly and irregularly crescent-shaped marking of ochraceous-buff, which has caudad at each side of the median line a minute triangular invasion of the dark coloration. Dorsal surface of abdomen saccardos umber, suffused with blackish chestnut brown distad, broadly margined with light ochraceous-buff. Tegmina translucent tawny, except in area of humeral trunk, where they are heavily suffused with blackish chestnut brown as far as opposite the apex of the anal field, and from this suffusion to costal margin, where they are warm buff, this broad pale margin narrowing evenly and disappearing before the tegminal apex. Wings transparent, faintly tinged with prout's brown except in areas of branched veins, where this is heavy, veins prout's brown, this somewhat heaviest in marginal portion of costal field. Limbs warm buff, the coxae each with a heavy blotch proximad of blackish brown, the spines russet, this tinging the distal portion of the tibiae and the tarsal joints. Ventral surface of abdomen blackish brown, broadly margined laterad with warm buff.

Length of body, 17; length of pronotum, 4.9; width of pronotum, 6.2; length of tegmen, 19.1; width of tegmen, 5.2; length of caudal tibia, 7 mm;

The type of this handsome insect is unique.

Xestoblatta micra²⁷ new species (Plate VIII, figures 12 and 13.)

This, the smallest known species of the genus, shows in coloration and markings nearest agreement with *X. carrikeri* Hebard, described from the Santa Marta region of Colombia.

The male secondary sexual characters show, however, a development in some respects analogous to that found in *X. festae* (Griffini), though far less specialized.

In linear arrangement the species should be placed after *carrikeri* and before *festae*.

Type.—♂; Las Mesitas, Cúndinamarca, Colombia. Elevation, 3200 feet. May, 1918. (From A. Maria.) [Hebard Collection, Type no. 547.]

Size small, form broad for the genus. Interocular space wide (1.4 mm.), slightly wider than that between the ocellar spots, four-fifths as wide as that between antennal sockets. Ocellar areas weakly defined, but ocellar spots strikingly pale. Pronotum as characteristic for *Xestoblatta*.

Tegmina and wings reaching beyond apex of abdomen a distance somewhat less than the length of the caudal tarsal joints, venation as characteristic of the genus. Latero-caudal angles of fourth, fifth and sixth abdominal tergites

²⁷ From μικρά = small.

weakly acute-angulate produced in increasing ratio caudad. Sixth tergite with a small but very deep and sharply defined depression mesad, formed by two very deeply concave areas, this depression transverse, twice as broad as long. Seventh tergite almost completely concealed. Eighth tergite with latero-caudal angles weakly acute-angulate produced from points on its free margin cephalad of the cerci, the caudal margin transverse between these.

Supra-anal plate short, its length one-half its total basal width, caudal margin broadly convex between the cercal bases. Paired plates beneath the supra-anal plate specialized; sinistral plate with a chitinous arm directed ventrad, its apex produced in two sharp aciculate points, directed dextrad; dextral plate very large, extending to base of production of sinistral plate, its dorsal and ventral margins parallel, its disto-ventral angle produced sinistrad in a sharp point, with distal margin there concave. Subgenital plates with sinistral margin weakly convex to a small, simple, unarmed, sinistral style, thence weakly oblique to point of greatest production, dextrad. The surface of the plate is curled upward and produced sinistrad (the dextral style), this production tapering to its rounded apex and supplied with hairs (as is the subgenital plate and the distal margins of the supra-anal plate), the dextral margin thence obliquely ascending, straight, to the base of the plate.

Limbs as characteristic of the genus.

Allotype.—♀, same data as type. [Hebard Collection.]

Agrees with male except in the following features. Form very slightly broader, the interocular space very slightly broader. Tegmina and wings decidedly less elongate. Dorsal surface of abdomen unspecialized, with latero-caudal angles of fourth to seventh tergites weakly acute-angulate produced in increasing ratio caudad, eighth tergite almost completely concealed. Supra-anal plate moderately elongate, its length one-half its width between the cercal bases, caudal margin triangulate-convex with apex broadly rounded. Subgenital plate short, convex, with free margin very broadly convex to median portion, where the plate is narrowly curled upward, with margin very broadly convex.

Head ochraceous-buff; the vertex ochraceous-tawny, becoming deep chestnut brown to immediately below the light ochraceous-buff ocelli; a fleck of deep chestnut brown ventro-mesad of the base of each antennal socket, connected by a narrow transverse suffused band of cinnamon brown, which shows a ventrad arcuation. Pronotum buckthorn brown, disk heavily washed with russet, this strongest as a large vague patch on each side, the intervening area caudad paler in the female, ochraceous-tawny. Tegmina translucent dresden brown, the marginal field slightly paler. Dorsal surface of male abdomen mummy brown, with a very narrow, paler lateral margin, the sixth tergite and supra-anal plate ochraceous-buff with a suffusion of prout's brown. Dorsal surface of female abdomen buckthorn brown, with a very narrow buffy lateral margin, the tergites toward their caudal margins and supra-anal plate at cercal bases suffused with mummy brown. Cerci mummy

brown dorso-proximad and to near apex ventrad, shading in remaining portions to prout's brown. Limbs warm buff, the coxae each with a conspicuous but small blotch of mummy brown proximad and distad; the spines russet; the ventral margins of the femora lined with mummy brown, the tibiae with blotches of mummy brown at bases of spines and suffused distad with this color, the tarsi washed with tawny. Ventral surface of male abdomen mummy brown paling to dresden brown laterad and ochraceous-buff latero-sinistrad, the subgenital plate being suffused with mummy brown proximad and dextrad to near margin at point of greatest production, the remaining portions ochraceous-buff. Ventral surface of female abdomen blackish mummy brown paling to ochraceous-buff laterad, with a blotch of mummy brown on each segment, the subgenital plate shining blackish mummy brown, except in brief lateral portions, where it is ochraceous-buff.

Length of body, ♂ 17.5, ♀ 14.2; length of pronotum, ♂ 4, ♀ 3.9; width of pronotum, ♂ 5.1, ♀ 5; length of tegmen, ♂ 17.2, ♀ 15.2; width of tegmen, ♂ 5, ♀ 4.9; length of caudal femur, ♂ 6.7, ♀ 6.7 mm.

The species is known from the described pair.

Xestoblatta festae (Griffini) (Plate VIII, figures 14, 15 and 16)

1896. *E[pilampra] festae* Griffini, Boll. Mus. Zool. Anat. comp. Univ. Torino, XI, no. 236, p. 2. [[♀]; Punta de Sabana, Darien.]

Murindo, Intendencia del Chocó, II, 16, 1918, (M. A. Carriker, Jr.), 1 ♂.

The male here recorded agrees fully with a male recently taken in the Canal Zone, Panama, by the author. Females from the Canal Zone accord throughout with the original description of *festae* and undoubtedly represent the opposite sex of the males mentioned above. It is further evident that, though the females recorded by us and described as this species in 1916,²⁸ were correctly assigned, the male there described as *festae* represents a distinct species, which we here name *Xestoblatta hoplites*.²⁹

As the male sex of the present species was previously unknown, we give the following description of this remarkable insect, which shows the highest specialization of the fourth, fifth, sixth and seventh abdominal tergites we have found in the Blattidae.

Size medium, form moderately broad, rather slender for the genus. Interocular space (.9 mm.) slightly over half as wide as space between antennal sockets. Ocellar areas very weakly defined. Pronotum as characteristic of genus, but not proportionately fully as broad as in *festae*.

Tegmina and wings fully developed, with venation as characteristic of *Xestoblatta*, with intercalated triangle broad, as in *carrikeri*. Wings with

²⁸ Trans. Am. Ent. Soc., XLII, p. 377.

²⁹ Type: ♂; Rio Machuca, Costa Rica, 150 meters, January, 1907, (P. Biolley), [Academy of Natural Sciences of Philadelphia, Type no. 5373].

(three) complete and (three) incomplete branches of the ulnar vein. Median segment unspecialized. Abdominal tergites with latero-caudal angles not produced; fourth with median third produced caudad in a rounded trapezoidal plate, which extends as far as the caudal margin of the sixth tergite, thereby covering a large circular cavity, which occurs mesad in the sixth tergite; fifth tergite with caudal margin transverse to margins of produced fourth tergite, thence deeply concave-emarginate in median half, this emargination affording space for the cavity in the sixth tergite. Seventh tergite rather broadly visible, eighth apparently absent.

Supra-anal plate produced, rounded trapezoidal between cercal bases, this portion with length three-quarters its proximal width. Subgenital plate with distal portion of dorsal surface remarkably specialized as follows: dextral surface of plate produced distad on its internal surface in a heavy, cylindrical process, which is slightly longer than wide; from the flat apex of this process springs the dextral style, a stout process nearly four times as long as its proximal width, tapering to a heavy spine which forms its apex, and bearing dorsad near the base of this spine another similar but smaller spine, directed dorso-distad; the direction of base and style is weakly meso-dorsad, nearly on a line with the dextral margin of the plate. Subgenital plate with sinistral surface produced dorsad on its internal surface in a large heavy, rounded process, from the apex of which springs an exceedingly elongate and tapering agglutinated mass of spiniform hairs, which mass is sharply recurved at its base and directed ventro-sinistral; the dextral portion of the production forms a broad plate from apex to base, of such a form that the entire caudal surface of the production is concave, the free margin of this plate supplied with a heavy fringe of very elongate spiniform hairs, these directed distad, with distal portions of all but the more dorsal curving sinistral (see plate VIII, figure 16). Subgenital plate with brief sinistral margin deeply concave-emarginate to two minute projections, which are situated sinistral, the dextral margin strongly oblique proximad, then forming an angulation, straight and very weakly oblique to the apex formed with the sinistral margin; projections at this apex, two minute, cylindrical processes, with apices rounded, the dextral of which is twice as long as the sinistral.

Limbs as characteristic of the genus.

Head ochraceous-buff, with vertex dark chestnut brown to above ocellar areas and two small points of the same, joining in a transverse marking below and between the antennal sockets. Pronotum chestnut brown, this shading gradually into the narrow ochraceous-buff margin cephalad, which becomes wider on the lateral margins and invades the darker area briefly latero-caudad. Tegmina translucent tawny, except the marginal field which is ochraceous-buff. Wings transparent, tinged with prout's brown, this heavy in areas of branched veins, veins prout's brown, this somewhat darkest in marginal portion of costal field. Dorsal surface of abdomen prout's brown,

with lateral margins narrowly buff and distal half of production of fourth tergite buffy. Limbs ochraceous-buff, the coxae each with a proximal and distal suffused fleck of mars brown, the spines russet, the tibiae tinged with cinnamon brown, heavily only at extremities; the tarsal joints paler, ochraceous-tawny. Ventral surface of abdomen buffy, deepening to mar- brown distad.

Length of body, 18.5; length of pronotum, 4.3; width of pronotum, 5.7; length of tegmen, 18.9; width of tegmen, 5.2; length of caudal tibia, 7.3 mm.

Xestoblatta hamata (Giglio-Tos)

1898. *I[schnoptera] hamata* Giglio-Tos, Boll. Mus. Zool. Anat. comp. Univ. Torino, XIII. no. 311, p. 4. [♂, ♀; Santiago and Gualaquiza, Ecuador.]

Andagoya, Antioquia, IV, 22, 1918, (M. A. Carriker, Jr., 2 ♀).

These individuals apparently differ from the originally described females in features which may be due either to slight inaccuracies in the original description, or to individual variations. Material of both sexes would quickly solve the problem.

In the present material the head is not completely testaceous, being, as in *X. festae* (Griffini), ochraceous-buff, with vertex to above the ocelli dark russet, with a narrow transverse suffusion of this same color between the antennal sockets, showing a weak convexity ventrad.

The measurements for the females here recorded are: length of body, 25 to 23; length of pronotum, 5.8 to 6; width of pronotum, 7.4 to 7.6; length of tegmen, 24.7 to 25.1; width of tegmen, 7 mm.

Euphyllodromia elegans (Shelford)

1907. *Pseudophyllodromia elegans* Shelford, Ann. Mag. Nat. Hist., (7), XIX, p. 34. [♀; Maroni [River], French Guiana.]

Cauca, 1 ♂, [A. N. S. P.].

The species is apparently widely distributed in South America, as a male, which agrees fully with the specimen here recorded, is in the Academy Collection, collected by C. F. Baker at Pará, Brazil.

Euphyllodromia stigmatosoma new species (Plate IX, figure 19.)

The present species agrees closely with *E. hystrix* (Saussure) in pronotal markings, but differs widely in the striking and distinctive marking of the dorsal surface of the mesonotum, metanotum and abdomen.

Type.—♂; Andagoya, Antioquia, Colombia. April 22, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 549.]

Size small for the genus, form and structure normal. Head with interocular space (.7 mm.) three-fifths width of space between antennal sockets. Ocellar spots small and weakly indicated. Maxillary palpi and pronotum normal.³⁰

Tegmina and wings less ample than in *hystrix*,³¹ length distinctly less than body length, not as in that species with length distinctly greater than body length. Dorsal surface of abdomen developed as is apparently normal for the genus.³²

Supra-anal plate strongly transverse, showing a broad and weak triangular production between cercal bases, with rounded apex obtuse-angulate. Concealed genitalia complex. Subgenital plate symmetrical, surface with a flexure dorsad toward the free margin, sinistral margin, from brief proximal portion, declivent and weakly concave to median portion, dextral margin showing a sudden, small but strong concavity below the cercus, thence straight, declivent to median portion; median portion with two deeply inset plates, which are attingent distad, these slightly shorter than the proximal width, with free margin rounded, the curvature strongest dorso-distad, fitting snugly between these styles is a short, narrowly triangular plate, with dextro-caudal margin armed with minute sharp teeth.

Limbs as characteristic of the genus.³³

Head ochraceous-buff, shading to ochraceous-orange on occiput. Antennae with first joint ochraceous-buff, other joints mummy brown, except the more proximal ventrad, where they are ochraceous-buff. Maxillary palpi ochraceous-buff, fifth joint suffused with mummy brown, this color showing distad in a line along the ventro-cephalic margin of the third joint. Pronotum shining, lateral margins transparent, showing a faint buffy tinge. Disk of pronotum blackish brown, except for the following markings: cephalic margin narrowly warm buff, this continued caudad by two broader, straight lines, just within the discal margin, which diverge caudad and widen in caudal portion, but are there transparent, a narrow medio-longitudinal line of warm buff also extends caudad, widening mesad and interrupted caudad of that area, the mesal widening showing an ochraceous-tawny medio-longitudinal linear suffusion. Mesonotum blackish brown, with a medio-longitudinal line and a fleck on each side of white. Metanotum prout's brown, suffused with mummy brown meso-laterad and with a suffused white spot on each side caudad. Median segment and first to fifth abdominal tergites blackish

³⁰ As described, Mem. Am. Ent. Soc., no. 4, p. 84, (1920).

³¹ Comparison is made with a Costa Rican female in the Academy Collection.

³² Described, Mem. Am. Ent. Soc., no. 4, p. 84, (1920).

³³ Described, Mem. Am. Ent. Soc. no. 4, p. 82, (1920).

brown, each with a transverse, roughly oval, white area on each side caudad, these showing a faint bluish tinge, the largest pair on the second tergite. Remaining dorsal surface of abdomen blackish brown, except median specialized area of sixth tergite, which is russet.

Tegmina transparent, nearly colorless, except for the following markings: veins prout's brown, this extending as a broad suffused area along the distal half of the discoidal vein toward the costal margin, distad spreading around the distal portion of the discoidal field as a weaker suffusion, the free margin of the anal field rather broadly prout's brown, particularly distad where it is continued slightly beyond the apex of this field, the anal sulcus also narrowly margined with prout's brown, the proximal portion of the area occupied by the discoidal sectors weakly tinged with ochraceous-tawny. Wings clear hyaline, iridescent, veins prout's brown, area of enlarged portion of costal veins in proximal half prout's brown, in marginal half light buff, the former continued around the apex of the anterior field as a broad suffusion. Cerci with dorsal surface light buff, suffused proximad and along the internal margins with blackish brown, ventral surface ochraceous-tawny, becoming prout's brown along internal margin. Ventral surface ochraceous-buff, the abdomen marked proximad and laterad with mummy brown. Limbs ochraceous-buff, the femora narrowly margined dorsad with prout's brown, the tibiae with heavy flecks of this color at bases of dorsal spines.

Length of body,³⁴ 10.8-10.3; length of pronotum, 2.6-2.7; width of pronotum, 3.7-3.8; length of tegmen, 9.8-9.7; width of tegmen, 2.6-2.7 mm.

In addition to the type, a paratypic male, bearing the same data, is before us.

Euphyllodromia angustata (Latreille)

1811. *Blatta angustata* Latreille, in Humboldt and Bonpland, Recueil. Observ. Zool. et Anat. comp., 1, p. 146, pl. xv. fig. 9. [Vera Cruz, Vera Cruz, [Mexico].]

Andagoya, Antioquia, IV, 22, 1918, (M. A. Carriker, Jr.), 1 ♂, 4 ♀, 1 juv. ♀.

The species is the most abundant of the genus from tropical Mexico, southward to Panama. The present material shows that its distribution extends well down through the Colombian Chocó, probably the only region in South America in which it occurs. The present record is the first for the species from that continent.

NYCTIBORINAE

MUZOA new genus

This genus would superficially appear to be very near *Nyctibora*, but numerous features of limb armament and structure, as well as of the cerci and male subgenital plate show wide diversity.

³⁴ The measurements of the type are given first.

The symmetrical tarsal claws are found elsewhere only in *Meguloblatta* in the recognized genera of the Nyctiborinae. So distinctive is the present genus, that its proper position is a problem.

After considering the evidence, we feel it best to place *Muzoa* immediately after *Nyctibora*. The Nyctiborinae, unlike the Pseudomopinae, is a small subfamily including comparatively few genera, these representing a number of very distinct units, of one of which *Muzoa* is the single known member.

Genus monotypic. Genotype.—*Muzoa simplex* new species.

Known in the adult condition only from the male sex. Head, pronotum, tegmina and wings of similar structure to *Nyctibora*. Interocular space wide, wider than in any known species of that genus. Ocellar spots small but distinct. Supra-anal plate symmetrical, briefly emarginate mesad. Cerci broad and heavy, subspatulate, but with apices rather sharp. Subgenital plate symmetrical, the styles of equal length. Cephalic femora with ventro-cephalic margins armed with minute and well spaced spiniform hairs (no heavier than the spiniform hairs on the adjacent surfaces), which change to minute spines distad, terminating in three heavy spines which increase greatly in length distad, the distal being very elongate. Other ventral femoral margins supplied with heavy spines, of which those on the caudal margins of the median and caudal limbs are very elongate. Four proximal tarsal joints each furnished with a pulvillus. Small arolia present between the bases of the elongate, symmetrical tarsal claws.

Muzoa simplex new species (Plate IX, figures 20 and 21.)

The present insect looks much like a depauperate specimen of *Nyctibora obscura* Saussure, having more decidedly reduced organs of flight. Closer examination shows it to differ not only in specific features, but also in characters which oblige its assignment to a distinct genus.

Type.—♂, Muzo, Boyacá, Colombia. Elevation, 2700 feet. September, 1919. (From A. Maria.) [Hebard Collection, Type no. 668.]

In addition to the characters given in the generic description, we consider the following specifically diagnostic. Size near that of the comparatively small *Nyctibora azteca* Saussure and Zehntner,³⁵ form appreciably broader,

³⁵ Compared with a Mexican female in the Hebard Collection.

structure similar, heavy. Head with interocular space three-quarters as wide as that between the ocelli. Pronotum of the characteristic *Nyctibora* type, proportionately broader with caudal angulation weaker than in *azteca*. Tegmina and wings showing marked reduction, but extending slightly beyond the apices of the short cerci. Venation as characteristic of *Nyctibora*, the wing veins, however, heavily suffused.

Supra-anal plate transverse, the lateral margins straight and convergent to the two broadly rounded distal extremities, which are symmetrical and, joining mesad, form a rather weak, rounded median emargination. Cercus very broad fusiform, subspatulate, dorsal surface deplanate, lateral margins broadly convex, converging distad to the rather sharp apex. Paired plates beneath supra-anal plate with ventral portion of sinistral developed into a heavy, elongate, cylindrical shaft, directed mesad along the ventral margin of this plate and distad curving cephalad to its acute apex. Subgenital plate small, short lateral margins hairy, straight and convergent to distinct emargination on each side, in which the styles are set, between these symmetrical, weakly angulate-convex. Styles heavy, symmetrical, slightly over three times as long as broad, cylindrical, but showing dorsal and ventral flattening in proximal half, with apex rather sharply rounded.

Tarsal joints heavy, but slightly more elongate than is usual in *Nyctibora*, the caudal metatarsus as long as the combined length of the succeeding joints.

General coloration shining dark chestnut brown, pile buffy. Wings with veins suffused with mummy brown, this causing the anterior field to be in large portion subopaque, spreading over all but the proximal portion and the area narrowly adjacent to the median vein to its distal portion, which portions and the radiate field are transparent.

Length of body, 21.5; interocular width, 1.2; length of pronotum, 6.8; width of pronotum, 10; length of tegmen, 20.4; width of tegmen, 8.7; length of cercus, 3.4; width of cercus, 1.5; length of caudal femur, 8.7; length of caudal metatarsus, 3.2 mm.

In addition to the type, three immature females, one large, two half grown, from Villavicencio, Intendencia del Meta, Colombia, taken in July, 1917 and December, 1918, for A. Maria, are before us.

These show remarkable features of coloration, for, though generally shining blackish brown, three to five terminal joints of the antennae and the distal half of the cerci are strikingly buffy. No such striking color characters are known to us for immatures of the species of the genus *Nyctibora*.

Paratropes phalerata (Erichson)

1848. *B[atta] (Nyctibora) phalerata* Erichson, in Schomburgk, Reise in Brit. Guiana, III, p. 580. [British Guiana.]

1920. *Paratropes pinoganae* Hebard, Mem. Am. Ent. Soc., no. 4, p. 89, pl. v, fig. 5. [♀; Pinogana and Corozal, Panama.]

Muzo, Boyacá, VII, 1919, (from A. Maria), 1 ♂, 1 ♀.

Villavicencio, Intendencia del Meta, II, 1920 and VI, 1918, (from A. Maria, 2 ♀.)

The present specimens show that *pinoganae* represents a mere variation of *phalerata*, unworthy of nominal recognition. The features upon which that supposed species was based are found to be subject to decided variation. Thus the Villavicencio individuals and one from Muzo are intermediate in tegminal form between Panamanian (*pinoganae*) and Guianan examples before us; those from Villavicencio agree with the former in pronotal, tegminal and wing markings, but with the latter in having black cerci. The pair from Muzo agree with the Guianan specimens in pronotal marking; the male agrees with them in tegminal form and in having a very broad wing band, but with the Panamanian examples in tegminal marking and pale cerci, the female agrees with the Guianan specimens in having dark cerci, but with the Panamanian specimens in tegminal markings and narrow wing band.

Though the series available is deplorably small, it appears to be certain that we have an extremely variable unit to deal with, the differences noted being ascribable wholly to individual variation.

Paratropes metae new species (Plate IX, figure 22.)

Though showing in depth of coloration nearest agreement with *P. elegans* (Burmeister),³⁵ the present species is more nearly related to *P. aequatorialis* Saussure. This is shown by its form and the presence of a distinct tegminal sulcus.

Type.—♀; Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. September, 1918. (From A. Maria.) [Hebard Collection, Type no. 666.]

Size medium, form normal for the genus, not as broad as in *elegans*. Head with interocular space very wide for the genus (.85 mm.), fully three-fifths that between the minute but distinct ocellar spots. Antennae missing.

³⁵ Material of this species from British Guiana and Brazil is before us.

Pronotum as characteristic of the genus; cephalic margin slightly more broadly convex than caudal margin to the sharply rounded lateral angles, caudal margin showing a trace of humeral angulation. Tegmina and wings extending much beyond apex of abdomen, tegmina more elongate than in *elegans*, with anal sulcus decided. Genitalia and limbs as characteristic of the genus.

Head and underparts shining black, except abdominal margins which on proximal segments are bordered with buffy, this confined to the proximal portions of the lateral margins of the more distal segments, the subgenital plate broadly margined in distal portion with this color. Pronotum black, with a broad cephalic marginal band of very rich ochraceous-buff, this slightly broader laterad, with its caudal margins there very broadly convex, mesad with median invasion of black area shallow, its lateral margins oblique to the transverse median portion. Tegmina translucent in pale portions, russet, with a broad black humeral band, a narrower oblique black band springing from proximo-marginal portion of anal field, sutural margin rather broadly margined with black, this widening at apex and reaching juncture of the two larger bands; costal margin with black to near distal extremity, this moderately widened mesad. Wings transparent, ochraceous-tawny with an orange tinge, anterior field broadly margined distad with blackish brown, radiate field broadly bordered with a weak suffusion of blackish brown, which is of nearly equal width throughout. Dorsal surface of abdomen shining black, margined broadly laterad with buffy. Cerci black.

Length of body, 17.5; length of pronotum, 5.3; width of pronotum, 9.3; length of tegmen, 21.5; width of tegmen, 9 mm.

The type of this species is unique.

***Megaloblatta blaberoidea* (Walker)**

1868. *Epilampra blaberoidea* Walker, Cat. Dermapt. Saltat. Br. Mus., v, Suppl. Blatt., p. 12. [♂, ♀; Chontales, Nicaragua.]

Muzo, Boyacá, V, 1919, (from A. Maria), 1 ♂.

Length of body, 63; interocular width, 1.8; length of pronotum, 14.7; width of pronotum, 21.8; length of tegmen, 78; width of tegmen, 30.2, length of caudal femur, 23.3 mm.

EPILAMPRINAE

***Leurolestes pallidus* (Brunner)**

1865. *Nauphoeta pallida* Brunner, Nouv. Syst. Blatt., p. 286. [Cuba.]

Fusagasugá, Cundinamarca, V, 1919, (from A. Maria), 1 ♂.

Las Mesitas, Cundinamarca, V, 1918, (from A. Maria), 1 ♂.

Villavicencio, Intendencia del Meta, V, 1919 and XII, 1917, 1918, (from A. Maria), 4 ♂, 7 ♀, 6 juv.

This tropical domiciliary species has, for South America, previously been recorded only from Brazil.

***Epilampra substrigata* Walker**

1868. *Epilampra substrigata* Walker, Cat. Blatt. Br. Mus., p. 73. [Unknown locality]

Susumuco, Cundinamarca, V, 1919, (from A. Maria), 3 ♀.

Villavicencio, Intendencia del Meta, XII, 1918, (from A. Maria), 2 ♂, 6 ♀, 2 juv. ♀.

The present series agrees fully with Walker's description, except that in no individual is the tegminal reduction equalled. The majority have the organs of flight extending slightly beyond the apex of the supra-anal plate, in but two females do these members fail to reach that point by a very brief distance.

The head has a very broad blackish interocular band, invaded by rays from the buffy vertex, these rays varying with intensification and recession of the color pattern, sometimes subobsolete, sometimes very narrowly severing the band. The vertex and face are finely but not thickly dotted with blackish brown, these dots fusing in intensive specimens to form a very narrow subocellar transverse band and a delicate picturing below. The pronotum is minutely and very heavily dotted with blackish brown, so finely and evenly that it appears almost solidly colored to the naked eye. The tegmina are minutely and thickly dotted with dark brown, a moderate number of larger flecks, lighter than the dots, occurring in the distal portion. The wing coloration is striking, the anterior field being strongly tinged with ochraceous-tawny, transparent except in area of the costal veins, where it is opaque and mars brown in coloration, radiate field is transparent, faintly tinged with sepia, except distad near the intercalated triangle where a faint ochraceous-tawny tinge is noted, showing a weak tessellation, the veins of this field are sepia. The ground coloration of the insect, including the limbs, is clay color, the limbs with fine longitudinal streaks and frequent dots of mummy brown. The abdomen is heavily suffused with blackish brown dorsad, except for a very narrow buffy margin, ventrad it is clay color, heavily and thickly dotted with mummy brown.

The extremes of the series are as follows; length of body, ♂ 21-20, ♀ 25.2-27.8; length of pronotum, ♂ 5.4-5.5, ♀ 6.2-6.7; width of pronotum, ♂ 6.4-6.7, ♀ 7.6-8; length of tegmen, 21.1-20.7, ♀ 21.2-23.8; width of tegmen, ♂ 6.5, ♀ 6.9-7.1 mm.

We feel it advisable to diagnose this material fully, due to the fact that, since the somewhat unsatisfactory original description, the species has not been reported.

Compared with a recorded Brazilian series of *E. grisea* (De-Geer), in the Philadelphia Collections, *substrigata* is seen to be rather closely related, though separable by numerous important features.

***Epilampra stigmosa* Giglio-Tos**

1898. *E[pilampra] stigmosa* Giglio-Tos, Boll Mus Zool. Anat. comp Univ. Torino, XIII, no. 311, p. 8. [♂; Valley of Santiago, Ecuador.]

Villavicencio, Intendencia del Meta, XII, 1918, (from A. Maria), 2 ♀.

The conspicuous whitish patch, occupying all of the distal portion of the area of the costal veins of the wings, is a striking feature in this species, which otherwise shows a rather decided similarity to *E. colombiana* Saussure. We feel satisfied, however, from study of the description and comparison with Panamanian specimens of *colombiana*, in the Philadelphia Collections, that *stigmosa* represents a valid specific unit.

***Homalopteryx laminata* Brunner⁷**

1892. *Homalopteryx laminata* Brunner, Proc. Zool. Soc London, 1892, p. 204, pl. xv, fig. 1. [♀; Chateaubelais and in forest at 2000 feet, St Vincent, West Indies.]

New York quarantine, VI, 30, 1914, (H. B. Shaw, in orchids shipped from Puerto Colombia, Atlantico, Colombia), 1 juv. ♂.

We are able to make the above assignment with certainty, owing to the presence in the Philadelphia Collections of a large series of this interesting species, from the Island of Trinidad and Venezuela. It is closely related to the genotype *H. capucina* Brunner, from Venezuela and Colombia.

The dissimilarity between the sexes of *laminata* is very decided, the male having fully developed organs of flight, the female retaining the lamellate form of the early stages and entirely lacking alar organs.

⁷ Incorrectly referred to *Rhucnoda* by Kirby, Syst. Cat. Orth., 1, p. 124. (1904).

Hyporhcnoda metae new species (Plate X, figures 29 and 30.)

Compared with Panamanian females of the genotype, *H. reflexa* (Saussure and Zehntner), in the Philadelphia Collections, the female sex of the present species is seen to differ in its broader form, in lacking a medio-longitudinal carina on the pronotum, mesonotum and metanotum, in lacking rugae on the caudal margins of the dorsal segments, and in the heavier, though evidently much atrophied, limb armament.

From the genus *Rhcnoda* it differs in this sex in the distinctly reflexed pronotum, broader form, lack of rugae, absence of even rudimentary tegmina and reduced limb armament.

The male, we believe, will be found to have fully developed organs of flight and a very different form, but, as in *reflexa*, showing many features which readily enable the proper sex association.

Type.—♀; Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. December, 1918. (From A. Maria.) [Hebard Collection, Type no. 667.]

Size medium, form broad elliptical. Head hidden under pronotum. Head with surface of occiput polished and not impresso-punctate; eyes widely separated by a distance very slightly greater than that between the weakly defined ocellar spots; exposed surface of head very weakly and irregularly impresso-punctate and hairy, this heaviest in the flattened inter-ocular-ocellar area. Antennae short. Pronotum extending well beyond head, distinctly cucullate, the convexity beneath which the head fits distinct, without the lateral rugae found in *reflexa*, cephalic margin not thickened, evenly convex and moderately reflexed to the latero-caudal angles, which are weakly produced caudad; caudal margin very weakly concave on each side and very weakly convex mesad. Entire dorsal surface apparently smooth, but under high magnification seen to be thickly supplied with minute but well projecting, irregularly rounded rugae, these weakening and becoming less numerous caudad.³⁸ Tegmina and wings absent.

Supra-anal plate heavily chitinous, over twice as broad as long, the free margin convex, showing slight flattening laterad and a trace of median emargination. Cerci very short and lamellate, scarcely projecting beyond the body outline. Subgenital plate very large, simple.

Limbs showing some degree of atrophy of all spines, surfaces slightly roughened. Ventro-cephalic margin of cephalic femora armed with three (two to six in paratypes) heavy, irregular and irregularly placed spines, succeeded by an irregular row of rather elongate chaetiform spines, terminated by a small but heavy, though plainly decidedly atrophied, distal spine

³⁸ The structure of the cephalic and dorsal surface is such that all of the individuals before us are heavily coated with foreign particles.

(none to two in paratypes); other ventral femoral margins supplied only with a few chaetiform hairs, except cephalic margins of median and caudal femora, which are armed with one to three and one distal, heavy, though greatly atrophied, spines. Caudal metatarsus elongate, one and one-quarter times as long as combined length of succeeding tarsal joints, with two rows of spines ventrad and a row of more distantly placed spines on each side. Four proximal tarsal joints supplied with pulvilli, these occupying nearly the entire ventral surface of all except the metatarsus, the pulvillus of which is distal and scarcely longer than broad. Tarsal claws simple, symmetrical, with very heavy bases. Arolia absent.

General coloration bistre, the dorsal surface often wood brown, due to the coating of foreign particles. Face, limbs and proximal portion of ventral surface of abdomen mesad slightly paler, walnut brown.

Measurements (in millimeters)

	Length of body	Greatest width of body	Length of pronotum	Width of pronotum	Length of caudal femur
Type	26	17	8.2	14 1	8
Paratypes (13).. . . .	23 8-26.7	16-17 2	7 8-8 5	13 3-14.3	7 7-8.1
Paratype ³⁰	20	13	6 7	11.2	6 4

In addition to the type, fourteen paratypic females are before us, bearing the same data but taken from May, 1917 to August, 1919. Of these a single smaller individual may not have reached maturity.

Hyporhienoda litomorpha new species (Plate X, figures 31 and 32.)

The contour of this species is much more simple than that of *H. metae*, here described, the pronotum showing only a very feeble sub-cucullate condition above the head and having its cephalic margin not at all reflexed cephalad and weakly so laterad, while the microscopic rugae of the dorsal surface of the female are even finer and more regular.

In strength of limb armament and lack of a decided medio-longitudinal carina, it agrees closely with *metae*, differing from the Central American genotype *reflexa* (Saussure and Zehntner) in these respects, as well as in the sculpture of the dorsal surface of the female.

Compared with a Costa Rican male of *reflexa*, in the Hebard Collection, the species is found to differ additionally in this sex in having the head hardly even flattened in the inter-ocular-ocellar area, and there with impressed punctae much smaller and less numerous. The latero-caudal angles of the pronotum are

³⁰ We are unable to determine whether this specimen represents a depauperate adult or an immature example.

rather broadly rounded, not acute. The tegmina are glossy as if lacquered, but very similar in form and venation, except that the apex is not as evenly rounded and situated further toward the costal margin, the veins showing no minute swellings. The wings are similar, the veins heavier and more shining, with median vein unbranched.

Type.—♀; Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. 1919. (From A. Maria.) [Hebard Collection, Type no. 669.]

Size medium, larger than *metae*, form oval, the greatest width being across the abdomen mesad. Head hidden under pronotum. Head very broad, the reduced eyes widely separated by a distance (2.1 mm.) slightly greater than that between the weakly defined ocellar spots; exposed surface of head rather coarsely and thickly (but weakly and scantily as compared with the genotype) impresso-punctate; cheeks moderately supplied with hairs; face flattened, very feebly convex, with two transverse impressions just below and between the ocelli and on each side above the labial suture.

Pronotum extending well beyond head, showing a very feeble sub-cucullate condition, rather strongly convex to the scarcely reflexed narrow lateral portions of the cephalic margin, this margin subcingulate, evenly convex to the latero-caudal angles, which are weakly produced caudad, forming an angle of about ninety degrees; caudal margin as in *metae*. Entire dorsal surface apparently smooth and somewhat polished, but under high magnification seen to be very thickly supplied with very minute, flattened, irregularly rounded rugae, these changing proximad on abdomen to minute, flattened, scattered points, which decrease greatly in number caudad. Tegmina and wings absent. Supra-anal and subgenital plates as in *metae*. Cerci very short and lamellate, not projecting beyond the body outline.

Limbs showing some degree of atrophy of all spines, surfaces almost smooth. Ventro-cephalic margin of cephalic femora armed with five (five and seven in allotype) heavy, irregular and irregularly placed spines, succeeded by an irregular row of rather elongate chaetiform spines, terminated by a small but heavy, though plainly decidedly atrophied, distal spine (one and two in allotype, not showing as great atrophy); other ventral femoral margins with a few chaetiform hairs, except caudal margin of cephalic femora which is armed with one distal and one sub-distal spine (the same in allotype) and cephalic margins of median and caudal femora, which are armed with one to four and one distal (two to three and one distal in allotype) spines. Tarsi heavy, caudal metatarsus as long as combined length of succeeding tarsal joints. Tarsal armament, claws and pulvilli as in *metae*, except that the latter are slightly larger, that of the caudal metatarsus being one and a half times as long as wide.

Allotype.—♂, same data as type, except taken December, 1918. [Hebard Collection.]

Very dissimilar to female. Size smaller, form much more slender, structure much more delicate. Head much more slender than in female, eyes well developed, separated by a space slightly less than that between the well defined ocellar areas, inter-ocular-ocellar space with a few scattered impressed punctae, cheeks smooth. Antennae short.

Pronotum very much smaller than in female, extending beyond head, showing a feeble cucullate condition, weakly concave to broad and weak concavities before the scarcely reflexed lateral portions of the cephalic margin, this margin cingulate, evenly convex to the latero-caudal angles which are broadly rounded at, however, less than ninety degrees, caudal margin broadly convex, showing very slight production mesad and at the shoulders. Surface of pronotum very finely and thickly impresso-punctulate, a very fine medio-longitudinal line indicated in the sub-cucullate area, the disk with weak impressions, which recall those found in some species of the *Blaberinae*. Tegmina and wings fully developed, extending well beyond apex of abdomen. Tegmina delicate, glossy sub-chitinous, as wide mesad as distad, apex toward costal margin rather broadly rounded; marginal and anal fields proximad impresso-punctulate, remaining portions smooth. Wings with anterior field extending much beyond radiate field, median vein undivided; radiate field not folding in proximal portion when wings are closed, remaining portions folding; venation as characteristic of genus.⁴⁰ Abdominal tergites with latero-caudal angles acute, the sixth with those angles moderately produced caudad, the seventh and eighth tergites much narrower with only distal portions visible.

Supra-anal plate chitinous except narrowly mesad, where it is transversely weakly chitinous; free margin broadly convex to median point, where a small angulate emargination occurs, this continued as a medio-longitudinal sulcus to the sub-chitinous area; proximad the plate is impresso-punctate on each side in a small area. Cerci small, tapering to the bluntly rounded apex, extending as far caudad as apex of supra-anal plate, cylindrical with a broad external lamella, joints weakly defined. Subgenital plate asymmetrical, minute simple styles present, proximo-laterad in position, the dextral in a narrowly V-shaped subchitinous area, deflexed; dextral margin straight, rounding into the transverse distal portion, which rounds into the moderately oblique, feebly convex sinistral portion, which is feebly emarginate at the sinistral style; surface weakly convex but showing a convex ridge, running proximad from the dextral V-shaped sub-chitinous area.

Limbs much more slender than in female, their armament given with description of that sex.

Female above blackish brown, the pronotum with a paired suffusion along the cephalic margin each side of the median point of mikado brown, which extends over a third the distance to the latero-caudal angles. Face, margins

⁴⁰ Described, *Mem. Am. Ent. Soc.*, no. 4, p. 98, (1920).

of underside of thoracic segments and all of abdomen chocolate. Coxae buffy, femora and tarsi buffy suffused with cameo brown, tibiae cameo brown.

Male above shining blackish brown, the pronotum paling to ochraceous-tawny narrowly along the buckthorn brown cingulate cephalic margin, the ochraceous-buff suffusion extending on each side over half the distance to the latero-caudal angles. Tegmina shining blackish brown, transparent proximad, translucent distad. Wings transparent, veins shining blackish brown, the anterior field heavily tinged with this color, particularly heavy in area of costal veins, weak between median and discoidal veins, radiate field weakly tinged with blackish brown. Dorsal surface of abdomen shining blackish chestnut brown. Head with vertex and inter-ocular-ocellar area shining blackish brown, ocelli cream color, proximal antennal joints, remaining portions of head, thoracic segments and limbs ochraceous-buff, the face tinged with tawny, remaining antennal joint's prouts brown. Ventral surface of abdomen shining ochraceous-buff tinged with cinnamon brown.

Length of body, ♂ 25, ♀ 28; greatest width of body, ♀ 18; length of pronotum, ♂ 6.7, ♀ 9.7; width of pronotum, ♂ 9.4, ♀ 14.2; length of tegmen, ♂ 22; width of tegmen, ♂ 8; length of caudal femur, ♂ 7.3, ♀ 8.1; length of caudal metatarsus, ♂ 2.9, ♀ 2.9 mm.

This species, which of those assigned to *Hyporhcnoda* has the strongest Polyphagine facies, is known only from the described pair.

The addition of two new species to the genus *Hyporhcnoda* makes it necessary to change the generic diagnosis, in that the species are now known to show presence or absence of a medio-longitudinal carina.

BLATTINAE

Lamproblatta albipalpus Hebard

1919. *Lamproblatta albipalpus* Hebard, Trans. Am. Ent. Soc., XLV, p. 109, pl. xvii, figs. 7 to 9. [♂, ♀: Cincinnati, Sierra Nevada de Santa Marta, Colombia; Venezuela; Gatun, Obispo Station, zone limit five miles west of Empire, Corozal, Old Panama, Taboga Island and Tabogilla Island, Panama.]

Villavicencio, Intendencia del Meta, Colombia, XII, 1918, (from A. Maria), 1 ♂.

This species has been recorded from South America only from the localities noted above.

Periplaneta brunnea Burmeister

1838. *P[eriplaneta] brunnea* Burmeister, Handb. Ent., II, abth. II, part I, p. 503. [♂, ♀: Chile; Demerara [= British Guiana].]

Pensilvania, Cordillera Central, Caldas, VI, 1918, (from A. Maria), 1 ♂, 1 ♀.

Espinal, Tolima, IV, 1918, (from A. Maria), 1 ♀.

Villavicencio, Intendencia del Meta, VI, 1918, (from A. Maria), 1 ♂, 2 ♀.

This is a widely spread domiciliary species in the American tropics.

Periplaneta australasiae (Fabricius)

1775. [*Blatta*] *australasiae* Fabricius, Syst. Ent., p. 271. ["In nave e mare pacifico et regionibus incognitis revertente."]

Andagoya, Antioquia, IV, 22, 1918, (M. A. Carriker, Jr.), 1 ♂.

Pensilvania, Cordillera Central, Caldas, VI, 1918, (from A. Maria), 1 ♂, 3 ♀.

Córdoba, Valle, V, 23, 1918, (M. A. Carriker, Jr.), 1 ♀.

Las Mesitas, Cundinamarca, V, 1918, (from A. Maria), 1 ♂, 1 ♀.

Susumuco, Cundinamarca, VIII, to XI, 10, 1917, (from A. Maria), 2 ♂, 7 ♀, 1 juv.

Villavicencio, Intendencia del Meta, V, 1917 and XII, 1918, (from A. Maria), 5 ♂.

The habits of this species are similar to those of *brunnea*, and, in the American tropics, the insect is apparently even more generally distributed and abundant.

PANCHLORINAE

Leucophaea maderae (Fabricius)

1781. *B[latto] maderae* Fabricius, Spec. Ins., I, p. 341. [Madeira.]

Pensilvania, Cordillera Central, Caldas, VI, 1918, (from A. Maria), 1 ♂, 3 ♀.

Susumuco, Cundinamarca, VIII and XI, 10, 1917, (from A. Maria), 2 ♂.

Villavicencio, Intendencia del Meta, XII, 1918, (from A. Maria), 6 ♂, 11 ♀, 4 juv.

This species, like the two preceding, is a tropical domiciliary insect. It is very extensively distributed through the West Indies and has been recorded from widely separated points in South America.

Pycnoscelus surinamensis (Linnaeus)

1767. [*Blatta*] *surinamensis* Linnaeus, Syst. Nat., ed. XII, p. 687. [Surinam.]

Las Mesitas, Cundinamarca, V, 1918, 3 ♀.

This species, though not strictly domiciliary, is more often encountered about human habitations than elsewhere, and its wide distribution in tropical and subtropical America is, in all probability, largely due to its carriage by human agencies.

***Panchlora cubensis* Saussure**

1862. *P[anchlora] cubensis* Saussure, Rev. et Mag. de Zool.. (2), XIV, p. 230. [♀, Cuba.]

1919. *Pycnosceloides aporus* Hebard, Trans. Am. Ent. Soc., XLV, p. 300, figs. 1 and 2. [♀ [juv.]: Brownsville, Texas and Monte Diablo, California; Orizaba, Motzorongo and Minatitlan, Vera Cruz, Mexico; Pózo Azul de Pirris, Costa Rica; Porto Bello, Alhajuela, Rio Chilibre, Rio Trinidad, Cabima and Corozal, Panama]

We hasten to place our genus *Pycnosceloides* in synonymy under *Panchlora*, and the single described species, *aporus*, as a synonym of *cubensis*.

Breeding experiments, undertaken by us recently in Colombia, proved that the dark brown apterous individuals, upon which we based our description of a new genus and species, are no more than the immature condition of the present species, adults of which are a very pale green, with fully developed tegmina and wings. The size of immatures, which in the last instar is frequently as large as that of many adult females of the species, the coloration, very different and widely separated eyes, truncate pronotum and heavily chitinous supra-anal plate, led us into this deplorable error, from which the similarity of limb armament might possibly have saved us, had it been noted at the time.

Santa Marta, Magdalena, X, 1917, (M. A. Carriker, Jr.), 1 ♀.

Mamatoco, Magdalena, XII, 1917, (M. A. Carriker, Jr.), 2 ♂.

Muzo, Boyacá, IX, 1918, (from A. Maria), 1 ♀.

Villavicencio, Intendencia del Meta, (from A. Maria), 34 ♂, 16 ♀.

Rio Chili, affluent of the Rio Cauca, XII, 1918, (from A. Maria), 3 ♂, 5 ♀.

Individual size variation is very slight in the Villavicencio and Rio Chili series. The latter material averages larger for both sexes.

Panchlora exoleta Burmeister

1838. *P[anchlora] exoleta* Burmeister, Handb. Ent., II, abth. II, pt. I, p. 507. [Pará and Bahia, Brazil]

Villavicencio, Intendencia del Meta, (from A. Maria), 32 ♂, 19 ♀.

We are uncertain as to whether the material, recorded from Bogotá as this species,⁴¹ was actually secured at that locality.

Achroblatta luteola (Blanchard)

1843 *Blatta luteola* Blanchard, in d'Orbigny, Voy. Amér. Mérid., VI, pt. 2, p. 215, pl. 26, fig. 3. [Santa Cruz, Bolivia.]

Villavicencio, Intendencia del Meta, (from A. Maria), 1 ♂.

This is a small specimen; length of body, 13; length of pronotum, 4.2; width of pronotum, 5.2; length of tegmen, 15.1 mm.

Combined with its form the light brown coloration of this insect, with latero-cephalic portions of pronotum and three marginal patches of buffy on the tegmina, give it some resemblance to certain species of the Lampyridae (Coleoptera).

Phortioeca apolinari new species (Plate X, figures 33 and 34.)

This striking species is readily distinguished from the known members of *Phortioeca* by its smaller size, less strongly produced meso-cephalic cucullate portion of the pronotum, paler general coloration and striking color pattern.

Type.—♂; Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. September, 1918. (From A. Maria.) [Hebard Collection, Type no. 670.]

Size smaller than the other known species of *Phortioeca*, form similar. Head flattened, rather small, eyes separated by a distance slightly less than half that between the rather large ocellar spots. Pronotum extending well beyond head and cucullate in meso-cephalic portion, this portion defined from the elevated lateral and caudal portions by a distinct sulcus, the caudal portions briefly, broadly and flatly ridged longitudinally between the slightly more decided ridges at the humeral shoulders; surface polished, with well scattered rugae, particularly in the more elevated portions, with impressed punctae meso-caudad; cephalic margin decidedly cingulate, showing an extremely weak emargination on each side, due to the moderate production of the meso-cephalic portion, which is not as decided as in the other species; latero-caudal angles rounded, not sharply angulate, at slightly over ninety degrees; caudal margin oblique and very broadly convex to the humeral angles, between these transverse with a minute and brief, but distinct, angulate production mesad.

⁴¹ Mem. Am. Ent. Soc., no. 4, p. 107, (1920). The present series is discussed and *exoleta* compared with *cubensis* on the preceding page.

Tegmina and wings fully developed, broad, extending well beyond apex of abdomen; wings differing from those of *P. phoraspoides* (Walker) in having the transverse veinlets between the discoidal and median veins more numerous and delicate, the ulnar vein sending a few branches toward the median vein. Abdomen as characteristic of genus.

Cephalic femora rather slender, with the characteristic parallel dorsal and ventral margins found in the species of this and related genera; ventro-cephalic margin supplied distad with widely placed, microscopic, rather short, spiniform hairs, with a single very short, stout but greatly atrophied distal spine; ventro-caudal margin unarmed, except for a similar distal spine. Other ventral femoral margins completely unarmed, the caudal margins moderately supplied with microscopic hairs. Tarsal joints short and stout, metatarsus unarmed and supplied with a large pulvillus, which extends to near its base, three succeeding joints with ventral surfaces fully occupied by large pulvilli. Moderately large arolia present between the heavy bases of the simple, symmetrical, strongly curved tarsal claws.

Allotype.—♀; same data as type. [Hebard Collection.]

Very similar to male, size slightly larger, form broader. Pronotum with production of cucullate portion even less decided, so that the cephalic margin shows scarcely any emargination. Abdomen as characteristic of genus.

General coloration similar in the sexes. General dorsal coloration shining cinnamon buff. Pronotum beautifully pictured with blackish brown as figured, cingulate cephalic margin russet. Tegmina with humeral trunk broadly blackish brown, veins of the same coloration, these becoming much less conspicuous toward the costal margin and distad; proximal portions of anal and marginal fields conspicuously pale, the impressed punctae there seen, under the microscope, to be brown. Ventral surface of pronotum cinnamon-buff, with a large square suffusion of blackish brown laterad toward the latero-caudal angles, the tegmina with a smaller suffusion on their ventral surfaces toward the base of the marginal field. Head blackish brown, ocelli cream color, antennae uniform dark brown. Ventral surface ochraceous-buff, the coxae and lateral portions of abdomen heavily suffused with bister, four abdominal sternites with patches of ochraceous-buff in the center of the suffused area on each side. Cerci bister. Limbs ochraceous-buff, with cephalic femora entirely, and other femora dorsad and ventro-distad, heavily suffused with bister, spines mars brown.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
♂					
Villavicencio, <i>type</i>	25	7.7	12 1	26 8	10 4
Villavicencio, <i>paratype</i>	25	7.3	12	25 7	10 3
♀					
Villavicencio, <i>allotype</i>	29	8.3	13 8	27 7	11.6
Villavicencio, <i>paratype</i>	28 8	8.1	13	27 7	11.2
Susumuco, <i>paratype</i>	28.4	7.8	12.7	25.9	10.6

In addition to the described pair, a male and female paratype, bearing the same data, and a male paratype taken at Susumuco, Cundinamarca, elevation 2600 feet, September, 1917, also from A. Maria, are before us, as well as a large juvenile female, taken at Villavicencio in July, 1918.

Phortioeca phoraspoides (Walker)

1871. *Zetobora phoraspoides* Walker, Cat. Dermapt. Saltat. Br. Mus., v, Suppl. Blatt., p. 8. [♂; Chontales, Nicaragua.]

Muzo, Boyacá, II, 1919, (from A. Maria), 3 ♂.

Villavicencio, Intendencia del Meta, 1919, (from A. Maria), 1 ♀.

This splendid species, known previously only from Central America, is readily distinguished from the preceding by the larger size, solidly black major portion of the more cucullate pronotum, with broad cephalic margin ochraceous-buff mesad and ferruginous or vinaceous-rufous in lateral portions.

The female agrees fully with Central American females before us, except in having the organs of flight as fully developed as in the males and the tegmina less heavily suffused with blackish brown.

Capucina patula (Walker)

1871. *Zetobora patula* Walker, Cat. Dermapt. Saltat. Br. Mus., v, Suppl. Blatt., p. 8. [♂; Chontales, Nicaragua.]

Muzo, Boyacá, II, 1919, (from A. Maria), 1 ♂, 1 ♀.

This wood brown roach is distinctive in its very delicate structure, greatly flattened form and very broad tegmina. It has previously been reported only from Nicaragua and Costa Rica.

Compared with a Costa Rican series before us, the present pair is found to agree closely. The pronotum in these specimens is decidedly narrower than in the majority of the other series, that series showing, however, that the pronotum and tegmina are subject to decided variation in width, one Costa Rican female having the pronotum slightly narrower than that of the Colombian female at hand, the largest Costa Rican male showing, however, the following proportions: length of body, 29.2; length of pronotum, 9.8; width of pronotum, 17.3; length of tegmen, 27.4; width of tegmen, 13.5 mm.

The measurements for the pair here recorded are; length of body, ♂ 28.8, ♀ 28.8; length of pronotum, ♂ 8.6, ♀ 8.6; width of pronotum, ♂ 14, ♀ 15; length of tegmen, ♂ 26.3, ♀ 25.7; width of tegmen, ♂ 12, ♀ 12.3 mm.

Capucinella delicatula Hebard

1919. *Capucinella delicatula* Hebard, Mem. Am. Ent. Soc., no. 4, p. 111, pl. vi, figs. 2 and 3. [♂; Porto Bello, Panama: ♀; San Lorenzo, Sierra Nevada de Santa Marta, Colombia.]

In addition to the female type, we have before us four very small immature individuals, bearing the same data.

The male of this species suggests somewhat a very small, much paler, diaphanous replica of *Capucina patula* (Walker). The female, however, is a small patelliform insect, lacking entirely organs of flight and showing some similarity to immature individuals of *patula*, though with margins by no means as broadly lamellate.

BLABERINAE

Archimandrita tessellata Rehn

1903. *Archimandrita tessellata* Rehn, Trans. Am. Ent. Soc., xxix, p. 287. [♂; San Carlos, Costa Rica.]

1903. *Archimandrita marmorata* Rehn (in part not *Blatta marmorata* Stoll, 1813), *ibid.*, p. 287. [♀, Colombia.]

The differences separating this species from *marmorata* have been fully discussed by Hebard.⁴²

The specimen recorded from Colombia by Rehn was presented to the Academy of Natural Sciences of Philadelphia, June 2, 1857, by R. W. Mitchell, with the data "New Granada." It is probable that the specimen came either from Panama or from the Rio Atrato drainage. We are, therefore, unable to record definitely this species from Colombia as now limited.

Blaberus giganteus (Linnaeus)

1758. [*Blatta*] *gigantea* Linnaeus, Syst. Nat., ed. X, i, p. 424. [America.]

1802. *Blatta colosseus* Illiger, Mag. Insektenkunde, i, p. 186. [Demerara [= British Guiana].]

Espinal, Tolima, IV, 1918, (from A. Maria), 1 ♀.

Susumuco, Cundinamarca, VI, 1917, (from A. Maria), 1 ♀.

From study of the material in the Philadelphia Collections, as well as specimens recently received from the Guianas, we are

⁴² Mem. Am. Ent. Soc., no. 4, p. 113, (1920).

finally convinced that *B. colosseus* (Illiger) was based on a mere individual variation of *giganteus*, unworthy of nominal recognition.

***Blaberus parabolicus* Walker**

1868. *Blabera parabolica* Walker, Cat. Blatt. Br. Mus., p. 8. [♂; Cuenca [Ecuador].]

Villavicencio, Intendencia del Meta, IX, to XII, 1918 and 1919, (from A. Maria), 8 ♂, 9 ♀, 13 juv.

Rio Guatiquia, Intendencia del Meta, VI, 1917, (from A. Maria), 1 ♂, 2 ♀.

Susumuco, Cundinamarca, IX, 1917, (from A. Maria), 2 juv.

***Blaberus discoidalis* Serville**

1839. *Blabera discoidalis* Serville, Hist. Nat. Ins., Orth., p. 76. [♀, Santo Domingo.]

Santa Marta, Magdalena, X, 1907, (M. A. Carriker, Jr.), 1 ♂, 1 juv.

Mamatoco, Magdalena, XII, 1917, (M. A. Carriker, Jr.), 3 ♂, 2 juv.

Honda, Tolima, IV, 1918, (from A. Maria), 1 ♀, 2 juv.

Espinal, Tolima, IV, 1918, (from A. Maria), IV, 1918, 1 juv.

Susumuco, Cundinamarca, IX and X, 1917, (from A. Maria), 6 ♂, 1 ♀, 1 juv.

Villavicencio, Intendencia del Meta, VII and IX, 1918, (from A. Maria), 2 ♂.

Of the series those from Mamatoco are the largest, and those from Susumuco the smallest. The female from Honda shows decidedly the strongest intensification of coloration, with area between anal field and discoidal vein to median point on tegmina very heavily suffused with blackish brown. Every variation occurs to the more usual condition, in which the humeral trunk only, to opposite the apex of the anal field, is heavily suffused with blackish brown.

Juveniles of this species have the occiput and inter-ocular-ocellar area dark brown, rarely showing traces of buffy on the former and narrowly margining the eyes. Those of *parabolicus* are in general very similar, but have the occiput buffy in a usually extensive area, this color broadly bordering the eyes to the ocellar area.

CORYDIINAE

Hypercompsa anolaima new species (Plate X, figure 35.)

This species is very similar to the Brazilian *H. fieberi* (Brunner) in general appearance, differing signally in having the anal field divided by a heavy longitudinal vein.

Type.—♂; Anolaima, Cundinamarca, Colombia. Elevation, 5964 feet. April 6, 1917. (From A. Maria.) [Hebard Collection, Type no. 679.]

Size medium for this genus of very small species, form stout, tegmina and wings projecting well beyond apex of abdomen. Head with minute but distinct ocelli. Pronotum decidedly transverse, the width decidedly greatest caudad; latero-cephalic angles very broadly rounded and showing weak angulation, latero-caudal angles very broadly rounded without angulation; cephalic margin straight, transverse; caudal margin transverse, almost straight, showing very broad and feeble convexity. Tegmina and wings fully developed, venation apparently as characteristic of genotype, except that the anal field is divided by a nearly straight, heavy, longitudinal vein, forming an elongate subrectangulate area with the proximal two-thirds of the anal sulcus and a slightly subtriangular area with the sutural margin and remaining portion of the anal sulcus. Cerci with (eight in Panamanian specimen, damaged in type) strongly defined rounded joints. Supra-anal plate delicate, sub-bilobate. Subgenital plate with surface convex; weakly produced laterad, bearing at each apex a simple and comparatively large, straight style, between which the distal margin of the plate is rather strongly concave. Antennae, limbs, their armament, pulvilli and arolia apparently as characteristic of genus.

Allotype.—♀; same data as type. [Hebard Collection.]

Size decidedly larger, form slightly more robust than male. Supra-anal plate with free margin evenly convex. Subgenital plate with surface convex, deeply acute-angulate emarginate in meso-distal quarter, this area occupied by two valves, with surfaces very weakly concave, separated by a medio-longitudinal cleft.

General coloration blackish brown, this including head, ventral surface, opaque portions of tegmina and wings and greater portion of antennae, pronotum and dorsal surface. Antennae blackish brown, with four of the distal joints (twenty-fourth to twenty-seventh) buffy, forming a broad pale annulus. Pronotum blackish brown, broadly bordered with ochraceous-buff at latero-caudal angles, these areas narrowing along caudal margin, so that mesad they are subobsolete. In the Panamanian specimen before us, these areas are not as decidedly narrowed mesad, so that the caudal margin is narrowly but distinctly bordered with this color throughout. Dorsal surface of abdomen blackish brown, except that the latero-caudal portions of the median segment are narrowly whitish.⁴³

⁴³ This narrow transverse whitish area on each side is not to be confused with the large whitish latero-proximal spots found on the abdomen of *H. cynipoides* Walker, of which species material is now before us.

In addition to the described pair, a female of this species from Porto Bello, Panama, taken February 24, 1911, by A. Busck is before us,⁴⁴ property of the United States National Museum.

PERISPHAERIINAE

This subfamily, as far as the assigned American forms are concerned, is at present decidedly unsatisfactory. The first group including *Dasyposoma* and its allies, as recently assigned by us⁴⁵, is, from the material here studied, found to represent, at least in part, merely the juvenile condition of species belonging to the group containing *Hormetica* and its allies. As to that group, it appears very possible that it should be considered an aberrant complex, referable to the Blaberinae and not to the Perisphaerinae.

The characters used to separate the Blaberinae and Panchlorinae are, however, also unsatisfactory, and general revisionary treatment is much needed. At present we are able to state definitely that *Hormetica* and *Parahormetica* are very closely allied genera, as indicated by Kirby, certainly not referable to different subfamilies, as assigned by Brunner.

Hormetica subcincta (Walker)

1868. *Brachycola subcincta* Walker, Cat. Blatt. Br. Mus., p. 188. [♂, Colombia.]

Susumuco, Cundinamarca, X, 1918, (from A. Maria), 1 ♂.

Villavicencio, Intendencia del Meta, XII, 1918 and 1919, (from A. Maria), 2 ♂, 1 ♀.

The previously unknown female agrees in all respects with the males, except in contour and coloration of the pronotum. In this sex the pronotum is convex, showing no decided meso-lateral projections of the disk, with lateral margins very heavily cingulate as in the male, but not at all reflexed above the head. In coloration the pronotum is ochraceous-buff, with two very large meso-lateral patches of blackish brown, these each containing a moderately large, irregularly rounded area of ochraceous-tawny in the position of the striking pale spots of the male, and caudad of these a small patch of ochraceous-tawny on each side. The

⁴⁴ Recorded by Hebard as *H. fieberi* (Brunner), Mem. Am. Ent. Soc., no. 4, p. 119, (1920).

⁴⁵ Trans. Am. Ent. Soc., XLV, p. 119, (1919).

blackish brown areas are each connected with the caudal margin by a short but broad band, that margin being broadly margined with that color in its median half.

This is easily one of the handsomest species of the South American Blattidae.

***Hormetica apolinari* Hebard**

1919. *Hormetica apolinari* Hebard, Trans. Am. Ent. Soc., XLV, p. 128, pl. XVIII, fig. 4, pl. XIX, fig. 7. [♂, ♀; Fusagasugá, Cundinamarca, Colombia.]

New York quarantine, VI, 30, 1904, (H. B. Shaw; in orchids shipped from Puerto Colombia, Atlantico, Colombia), 1 medium small juv.

Muzo, Boyacá, IX, 1918, (from A. Maria), 1 ♂.

Susumuco, Cundinamarca, IX, 1917, (from A. Maria), 3 ♂, 1 ♀.

Villavicencio, Intendencia del Meta, IV to VIII, 1918 and 1919, (from A. Maria), 6 ♂, 7 ♀, 1 large juv. ♂, 1 large juv. ♀, 1 medium small juv.

Comparison of material before us, unquestionably assignable to *Dasyposoma* Brunner, as at present understood in the literature, with adults of *Hormetica apolinari*, shows beyond question that the material actually represents the immature condition of this species.

Further investigation convinces us that Saussure's *Dasyposoma marmorata*, described from a female from Venezuela,⁴⁶ which specimen was later recorded as from Colombia,⁴⁷ is an immature of a species of *Hormetica* closely related to *apolinari*. From the description we find that *marmorata* is, in the described immature condition, contrastingly colored, with head yellow, bearing a transverse band of fuscous.

Juveniles of the present species have the head blackish brown, the vertex to just above the ocelli yellowish, the delimiting of these areas obscure in these stages, but very sharply defined in adults. In all the immature stages before us the pronotum has two narrow marginal patches of yellowish on the cephalic margin each side of the head, the antennae with several whitish joints before the terminal joints. In the earlier stages individuals are otherwise solidly very dark blackish brown, in the later stages

⁴⁶ Rev. et. Mag. de Zool., (2), XXI, p. 113, (1869).

⁴⁷ Miss. Sci. Mex., Rech. Zool., VI, p. 122, (1870).

not quite so dark, sometimes with a more reddish tinge and with a paler, broadly crescentric and very weakly defined large area of russet meso-caudad on the pronotum.

From the description and figures of *nigra* Brunner, genotype of *Dasyposoma*, it appears probable that that species is based on an immature of some species of *Hormetica*. It will be impossible to determine this definitely until the type, or similar Brazilian material, has been studied.

One feature of particular interest is that arolia are not developed until the adult condition is reached. The absence of arolia in the adult condition of *Parahormetica* led Brunner to place that genus in the Blaberinae. As we have noted above, it is certain that these two genera are very closely related and possibly not referable to the Perisphaeriinae, as assigned by Kirby and generally in contemporary literature.

Considerable size variation is shown by the present series.

Measurements (in millimeters) of extremes

♀	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Susumuco (3) ..	34-36.8	12 8-13.7	16.2-18 4	25 8-26 7	14-14 3
Villavicencio					
(6) . . .	25 7-39 5	10 7-12.7	13.7-17 2	21 3-27.2	11 6-15.1
♂					
Susumuco .	37 5	12 2	16.6	23 8	13 7
Villavicencio					
(7).	28 8-31.5	10-11 1	13.3-15	19-21 8	10 3-12

In one male and one female, two very slightly paler antennal joints distad show a partial survival of the pale antennal annuli evident in the juveniles.

MANTIDAE⁴⁸

ORTHODERINAE

Choraedodis rhombicollis (Latreille)

1833. *Mantis rhombicollis* Latreille. in Humboldt and Bonpland, Recueil Obs. Zool. et Anat. Comp., II, p. 103, pl. xxxix, figs. 2 and 3. (No locality given.)

Andagoya, Antioquia, IV, 10, 1918, (M. A. Carriker, Jr.), 1 ♂.

⁴⁸ In the present paper we follow the same arrangement of the Mantidae given in our first Colombian study, not the more recent revised arrangement of Giglio-Tos, which, though on the whole more logical and satisfactory, shows numerous serious defects.

The present specimen of this large green mantid, with pronotum enormously dilated laterad, agrees fully with Central American males of the species before us. In this individual the pronotal proportions are: length, 24; greatest width, 30.7 mm.

MIOPTERYGINAE

Pseudomiopteryx bogotensis Saussure

1870. *P[seudomiopteryx] bogotensis* Saussure, Mittheil. Schweiz. ent. Gesellsch., III, p. 228. [♂; Bogotá, Colombia.]

Mamatoco, Magdalena, XII, 1917, (M. A. Carriker, Jr.), 1 juv. ♀.

Musonia surinama (Saussure)

1869. *Thespis* [surinama] Saussure, Mittheil. Schweiz. ent. Gesellsch., III, p. 70. [♂, Surinam.]

Cincinnati, Sierra San Lorenzo, Magdalena, 4000 to 5000 feet, VII, 10, 1913, (M. A. Carriker, Jr.), 2 ♂, 1 ♀.

THESPIS Serville⁴⁹

1831. *Thespis* Serville, Ann. Sci. Nat., XXII, p. 54.

1916. *Diamusonia* Giglio-Tos, Bull. Soc. Ent. Ital., XLVII, p. 6.

The type of *Thespis* was first selected by Rehn as *parva* (Olivier),⁵⁰ which name is based on the quoted description of *Mantis minuta* Drury. Most unfortunately Kirby was unable (in 1904), and Giglio-Tos failed in his more recent studies, to note this type fixation. Thus Kirby has attempted to fix the type of *Oligonyx* as this same species,⁵¹ but, as *parva* was originally referred with a query to *Oligonyx*, that type fixation was void and has no effect on the nomenclature involved.

Giglio-Tos points out this fact, selects validly the type of *Oligonyx* as *bicornis* Saussure,⁵² but, overlooking Rehn's type fixation for *Thespis*, selects as genotype of his new genus *Diamusonia* the same *parva* (Drury).⁵³ Thus *Diamusonia* falls as a synonym of *Thespis*.

⁴⁹ The synonymy here discussed was first indicated by Rehn, Proc. Acad. Nat. Sci. Phila., 1920, p. 226, footnote 11, (1920).

⁵⁰ Proc. U. S. Nat. Mus., XXVII, p. 565, (February, 1904).

⁵¹ By a lapsus calami giving *parva* of Drury, in error for *minuta*. Syn. Cat. Orth., I, p. 278, (November or later in 1904).

⁵² Bull Soc. Ent. Ital., XLVI, p. 191, (1915).

⁵³ Following Kirby in giving *parva* by mistake for *minuta*.

Thespis metae new species (Plate IX, figure 23.)

This species apparently shows nearest affinity to *T. media* (Giglio-Tos),⁶⁴ the male here described differing in its slightly smaller size, slightly deeper head, broader and more strikingly marked tegmina, proportionately more elongate tegmina and wings, of which the latter reach to the base of the supra-anal plate, very slightly shorter supra-anal plate and other less conspicuous features.

Type.—♂, Villavicencio, Intendencia del Meta, Colombia. Elevation, 1400 feet. October, 1919. (From A. Maria.) [Hebard Collection, Type no. 724.]

Size medium large compared with related species, small for the genus; form slender. Head with greatest depth three-quarters of greatest width; occipital outline in portion of occiput between eyes and the decided juxta-ocular sulci strongly convex, these portions raised above the eyes, the intervening median portion of the occiput as high mesad and slightly higher laterad, its dorsal outline weakly convex laterad and mesad, weakly concave meso-laterad on each side. Lateral ocelli slightly larger than median ocellus, the triangle which they form three-fifths as deep as wide. Facial scutellum very strongly transverse, about four times as wide as its median depth, its dorsal margin broadly convex, this margin rounded and not sharply defined.

Pronotum very elongate, its greatest width contained about four times in length of shaft; shaft with margins subparallel, scarcely narrowing to the supra-coxal expansion, the latter moderate, forming rounded obtuse-angulations, the collar narrower than shaft with margins nearly parallel beyond convergence caused by supra-coxal expansion. Lateral margins of pronotum minutely denticulate, the denticulations finer than in *media*, shaft with a distinct and rather decided medio-longitudinal carina, this carina very fine, subobsolete, on the collar; collar with rounded lateral carinae, the surface delicately concave above and below these.

Tegmina elongate, failing to reach apices of wings by a brief distance; broad, decidedly broader than in *media*, apex rather broadly rounded; marginal field thickly and minutely areolate, discoidal and anal fields with false veinlets between the veins, which with the cross-veinlets form large irregular areolae. Tegmina and wings microscopically very finely pilose, this coarser on the costal margins.

Supra-anal plate elongate triangular, length twice basal width, apex acute, dorsal surface with a very delicate medio-longitudinal carina. Cerci elongate, flattened, very hairy, the joints increasing in length distad, the distal joint bluntly rounded and over three times as long as its proximal width.

⁶⁴ Our comparison is made, with the brief original description, of a male from Trinidad, and a male from Caparo, Trinidad, taken in August, 1913, by S. M. Klages, in the Hebard Collection.

Subgenital plate slightly longer than basal width, styles elongate, flattened margin weakly convex and slightly over half as long as one of the styles.

Cephalic roxae slender, strongly carinate, unarmed. Cephalic femora with ventro-external margin armed with four, and one genicular, spines; ventro-internal margin with the following spine formula, I r I I I I I I I I I I I I. Cephalic tibiae with five external and ten internal spines on the ventral margins, which increase gradually in size and length distad. Median and caudal femora feebly sulcate dorsad to near extremities and with ventro-caudal margins strongly carinate.

Head snuff brown suffused with blackish, the dorsal margin of the occiput narrowly but conspicuously pinkish buff. Pronotum dull tawny olive with microscopic flecks and lateral lines of blackish, the margins and teeth paler, appreciably pinkish buff. Tegmina transparent, weakly tinged with tawny olive, costal margin slightly paler, mediastine and humeral veins microscopically margined with blackish, cross-veinlets of humeral field all in very brief portions at the true veins blackish (except at the ulnar and first branch of the median vein), these flecks conspicuous and reproduced in the homologous portions of the wing, but there obsolete proximad at the median vein and weak at that vein distad. Wings transparent, iridescent, showing scarcely any brown tinge except from the humeral vein to the costal margin, where they are weakly tinged with tawny olive. Abdomen dorsad clay color, microscopically streaked with darker brown, ventral surface clay color deepening to bister laterad. Limbs tawny olive suffused with bister, this heavier on their external faces.

Length of body, 46.7; width of head, 3.8; length of pronotum, 12.7; length of pronotal shaft, 9.1; width of pronotal supra-coxal expansion, 2.3; least width of pronotal shaft, 1.8; length of tegmen, 30; greatest width of tegmen, 6.3; length of wing, 26.1; length of cephalic coxa, 7.8; length of cephalic femur, 9.3; length of caudal femur, 17; length of caudal tibia, 16.3; length of caudal tarsus, 8.7; length of caudal metatarsus, 6.3 mm.

The type is unique.

Pseudomusonia⁵⁵ lineativentris (Stål)

1877. *M[usonia] lineiventris* Stål, Bih. till K. Svenska Vet. Akad. Handl.,
v, no. 10, p. 66. [♂, Colombia.]

Andagoya, Antioquia, IV, 22, 1918, (M. A. Carriker, Jr.),
1 juv. ♂.

⁵⁵ Proposed by Werner (Verh. k. k. Zool.-bot. Ges. Wien, LIX, p. 78, (1909)) to take the place of *Mionyx* Saussure, 1892, preoccupied by *Mionyx* Cope, 1886, a genus of lizards.

CARRIKERELLA⁵⁶ new genus

This genus is related to *Pogonogaster* Rehn, belonging to that section of the Miotpteryginae, as previously understood, which we believe Giglio-Tos has rightly separated as the Oligonicinae. In the great majority of features these genera agree closely, *Carrikerella* being strikingly distinguishable by having on the head a heavy cylindrical horn mesad above the ocelli, with apex bifurcate, while all of the pronotal and abdominal projections, and particularly those of the proximal abdominal tergites, are less highly specialized.

No other Oligonicine is known having the head with vertex produced, this being a feature frequent in Old World Empusids and Creobrotids, and found in the one South American member of the latter subfamily, *Callibia dianna* (Stoll), in which species this production is similar, except in being much heavier, higher in position, not carinate dorsad and more shallowly bifid at the apex.

The genus is monotypic. Genotype.—*Carrikerella ceratophora* new species.

Description of Genus.—(Female alone known.) Head apparently⁵⁷ slightly broader than deep, occiput raised above eyes, its outline nearly straight, showing very feeble convexity, with well rounded juxta-ocular portions which are more elevated than in *Pogonogaster*; frons bearing a heavy cylindrical horn, which has a delicate longitudinal carina dorsad and is bifid at apex; ocelli minute; facial scutellum moderately transverse (depth one-third width in *Carrikerella*, scarcely more than one-quarter width on *Pogonogaster*), its surface with a weak vertical median carina terminating near the ventral margin in a small node.

Pronotum very elongate, very feebly sigmoid in lateral aspect, supra-coxal expansion moderately well developed; dorsal surface of collar bearing a meso-proximal node and a median swelling; shaft with a distinct medio-longitudinal carina and a paired node

⁵⁶ In honor of our friends, Mr. and Mrs. M. A. Carriker, Jr., on one of whose field trips, to secure additional knowledge of the Ornithology of northern South America, the specimen upon which the present remarkable genus is based, was taken.

⁵⁷ The eyes are crushed somewhat in the only specimen available.

at the caudal margin; lateral margins of pronotum irregularly denticulate. Mesonotum and metanotum with tegminal and wing pads distinct, produced, and with a distinct medio-longitudinal carina, this carina forming with the caudal margin a small acute raised projection meso-caudad on each of these segments. Median segment with a similarly formed but larger, yet small and foliaceous plate meso-caudad, three succeeding tergites weakly carinate medio-longitudinally and similarly specialized meso-caudad, the remaining tergites with specialization weaker, similar to but more decided than that of metanotum; four proximal tergites produced latero-caudad in rounded lamellae, these smaller for the two succeeding tergites and much smaller for the two following these.

Supra-anal plate elongate trigonal, weakly carinate medio-longitudinally, with apex rather broadly rounded. Cerci moderately stout, not extending beyond apex of supra-anal plate, with joints well defined. Subgenital plate as in females of *Pogonogaster*, except that the cleft distal portion is not differentiated proximad from the proximal portion by a transverse depression.

Limbs and their armament as in *Pogonogaster*. Cephalic coxae with dorso-external margin microscopically denticulate, dorso-internal margin showing this condition even weaker, conspicuously lobulate distad. Cephalic femora slender, with three elongate discoidal spines, ventro external margin minutely denticulate and armed with four elongate spines, in addition to a small genicular spine; ventro-internal margin, in addition to a small genicular spine, with seven elongate spines, of which the second is much the longest. Cephalic tibiae armed proximad on ventro-internal margin with two minute spines,⁵⁸ curved distad, followed by a very elongate heavy spine, with a single spine of about half that size distad on ventro-external margin, externally distad with a similar spine mesad and a larger more curved spine dorsad. Caudal metatarsus longer than combined length of succeeding joints.

⁵⁸ The type of *Pogonogaster tristani* Rehn shows one of these spines on one of the cephalic tibiae, the other lacking armament in this area. That individual may prove to be a specimen abnormal in this respect.

Carrikerella ceratophora new species (Plate IX, figures 24, 25, and 26.)

Though having the abdominal appendages less decidedly and remarkably specialized than in the species of *Pogonogaster*, this insect, showing a similarly juvenile-appearing facies, is very remarkable in the bifid horn, developed on the head above the ocelli.

The apparently fully formed genitalia in the female at hand cause us to believe that the adult condition is represented.

Type.—♀; Andagoya, Antioquia, Colombia. April 22, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 738.]

In addition to the characters discussed in the generic diagnosis, we note the following for this species. Size comparatively small, form slender, abdomen somewhat enlarged. Antennae very short, exceeding slightly in length the horn above the ocelli. Triangle formed by ocelli three times as broad as deep. Pronotum with dorsal surface smooth, but developed as described; supra-coxal expansion less produced than in either of the known species of *Pogonogaster*. Foliaceous meso-caudal plate of second tergite largest, that of first tergite next in size, of third tergite next, and of median segment smallest of these.

General coloration clay color; pronotum with a few weak suffusions of sepia, the heavier of the marginal spines, which are widely spaced, sepia; abdomen dorsad with numerous microscopic weak flecks and dashes of sepia, the foliaceous meso-caudal and latero-caudal plates light yellowish olive, the lateral margins of the abdomen and margins of these plates (except the caudal margins of the latero-caudal plates) with minute flecks of sepia. Cephalic coxae buffy with a greenish tinge, with two vague suffusions of tawny olive. Cephalic femora warm buff with four suffused annuli of sayal brown, the two median of which deepen to snuff brown at the dorsal margin. Caudal tibiae and tarsi warm buff, the latter with distal joints and apices of proximal joints sepia. Median and caudal limbs buffy with a greenish tinge, flecked and obscurely annulate with bister. The tinge of green shown in the foliaceous plates and limbs may indicate that this specimen, in life, was of a much more greenish coloration.

Length of body, 28; length of cephalic cone, 1.5; length of pronotum, 9.8; width of pronotum at supra-coxal expansion, 2.7; length of pronotal shaft, 6.9; width of pronotum at narrowest portion of shaft, 1.2; length of process of median segment, .9; width of process of median segment, .6; length of process of second tergite, 1.3; width of process of second tergite, .8; length of supra-anal plate, 1.4; length of cephalic coxa, 7; length of cephalic femur, 8.3; width of cephalic femur, .9; length of cephalic tibia, 2.8; length of caudal femur, 7.1; length of caudal tibia, 8.2; length of caudal metatarsus, 4.3 mm.

The type of this remarkable mantid is unique.

CREOBROTINAE

Callibia diana (Stoll)

1813. [*Mantes*] *diana* Stoll, Natuur. Afbeeld. Besch. Spoken etc., pp. 74 and 78, pl. xxv, fig. 100. [1 ♀], "East Indies."⁸⁹

Muzo, Boyacá, II, 1919, (from A. Maria), 1 ♀.

This astonishing little mantid, with greatly produced vertex bifurcate at its apex, neck of pronotum on dorsal surface blunt conical, median and caudal femora with rounded lamellae distad on ventro-caudal margins, distinctive color pattern and bright coloration of tegmina and wings, has been previously correctly recorded from Cayenne, French Guiana; Dutch Guiana (as the synonymous *pictipennis*) and from Pernambuco and Ega, Brazil.

The present record shows that its distribution covers a very large section of tropical South America. It is apparently one of the scarcest of the American Mantidae.

VATINAE

Stagmatoptera septentrionalis Saussure and Zehntner

1894. *Stagmatoptera septentrionalis* Saussure and Zehntner, Biol. Cent.-Amer., Orth., I, p. 186, pl. VIII, fig. 2. [1 ♀; Bugaba, Panama.]

1894. [*Stagmatoptera septentrionalis*] var. *minor* Saussure and Zehntner, Ibid., p. 187. [1 ♀: Colombia; Venezuela.]

Boca Murindó, Intendencia del Chocó, II, 9, 1918, (M. A. Carriker, Jr.), 6 ♂.

Andagoya, Antioquia, IV, 22, 1918, (M. A. Carriker, Jr.), 1 ♂.

Muzo, Boyacá, VII and IX, 1918, (from A. Maria), 2 ♂.

Fusagasugá, Cundinamarca, X, 1918, (from A. Maria), 1 ♀.

Villavicencio, Intendencia del Meta, V, 1919, (from A. Maria), 1 ♀.

All of the features given by Saussure and Zehntner to separate their variety *minor* are attributable to individual variation, as is well shown by the Central American and Colombian series before us. We consequently place *minor* in the present synonymy.

⁸⁹ This locality was given in error, the species subsequently having been found to be exclusively South American.

Measurements (in millimeters) of extremes

		Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen marginal field
♂						
Boca Murindó (6)	67-70	22.2-24.9	4.6-4.8	46.8-50.8	3.1-3.8	3.8
Andagoya.....	65	23.8	4.7	48.3	3.4	
Muzo (2).....	66-75	24.3-27.4	4.8-5.1	50.4-50	3.4-3.7	
♀						
Fusagasugá	—	37.8	7.6	53	8.7	
Villavicencio	90	37.1	8.2	52	8.8	

The present series agrees in all important features with the Central American material at hand. The largest male, from Muzo, also shows the maximum intensive coloration. In this specimen the area of the stigma is subopaque, occupied by an irregular network of buffy veinlets. Though it is the only specimen showing this condition, we believe additional series will prove this to be an individual variation, or at least a feature of no specific or racial significance.

***Phyllovates stollii* (Saussure and Zehntner)**

1894. *Theoclytus stollii* Saussure and Zehntner, Biol. Cent.-Amer., Orth., I, p. 192. [♀: Guiana; Brazil.]

Choachi, Cundinamarca, XI, 1917, (from A. Maria), 1 ♀.

This specimen has the general coloration of the tegmina light olive green, with three suffusions and a number of flecks of bistre. In the previously recorded female, from Cincinnati, Magdalena, the tegmina are sayal brown shading to isabella color on the marginal fields, the markings weakly showing in slightly darker brown.

PHASMIDAE

ANISOMORPHINAE

***Autolyca bogotensis* (Goudot)**

1843. *Bacteria bogotensis* Goudot, Mag. de Zool., (2), v, pl. 125, figs. 1 to 11, p. 2. [♂, ♀; Bogotá, Colombia.]

Bogotá, Cundinamarca, XI, 30, 1919, (Forest Clark), 2 ♀, [U. S. N. M. and Hebard Cln.].

This shining black walking-stick, with minute, rounded, whitish, vestigial tegmina and wings, was found by Goudot to be abundant in the vicinity of Bogotá.

That author adds to his good description and excellent figures interesting data on the life history and habits of the species. It was found to be nocturnal, hiding under stones during the day. Individuals kept in captivity showed no preference for any particular food plant.

PSEUDOPHASMINAE

Stratocles viridis Hebard

1919. *Stratocles viridis* Hebard, Trans. Am. Ent. Soc., XLV, p. 146, pl. xxi, fig. 1. [♀; Muzo, Boyacá, Colombia.]

Villavicencio, Intendencia del Meta, VI, 1919, (from A. Maria), 2 ♀.

These specimens agree closely in all respects with the type, except that the green of the tegmina and wings is much less brilliant and also much less extensive. Tegmina with proximal portion of humeral 'trunk light paris green, other portions of dorsal field suffused with dull blackish, a weak greenish tinge showing between the veins. Wings with proximal two-thirds of area between mediastine and discoidal (humeral) veins, and all of area between discoidal and median veins, light paris green, remaining dorsal portion of anterior field suffused with blackish brown, showing a subobsolete tinge of greenish between the veins. In other respects the tegmina and wings are colored exactly as in the type.

Citrina venilia (Westwood)

1859. *Phasma venilia* Westwood, Cat. Orth. Ins. Br. Mus., Phasmodae, p. 118, pl. xxxiii, fig. 5. [♀; Bogotá,⁸⁰ [Colombia].]

Villavicencio, Intendencia del Meta, VI, 1919, (from A. Maria), 1 ♂.

The specimen here recorded, though the apex of the abdomen is missing, is evidently a male, the first of the sex of the splendid species to be recorded.

The coloration is more brilliant than described for the type female. Head, thorax, abdomen and cephalic limbs ochraceous-

⁸⁰ Like many of the early specimens of Natural History labelled "Bogotá," the type of this species certainly did not come from that city or its immediate vicinity. It was probably taken at a much lower altitude to the east and very possibly at, or near, Villavicencio.

buff with a tawny tinge. Other limbs of this color, except median femora in brief proximal portion and caudal femora in brief distal portion, which areas are olive yellow. Tegmina wax yellow, with areas between the sutural margin and first three veins and transverse veinlets blackish. Wings with anterior field proximad wax yellow, beyond the base in half toward costal margin paling to citron yellow, in remaining half toward radiate field rich bice green, this area from the median portion to apex suffused mesad with olive, the darker green broadening and occupying over half of the green area toward the yellow area at the apex; radiate field transparent, rich shrimp pink.

Length of body, (approximated) 52; length of pronotum, 2.8, width of pronotum, 1.7, length of mesonotum, 6; length of tegmen, 4.2; length of wing, 33.3; length of cephalic femur, 16; length of cephalic tibia, 15; length of caudal femur, 13; length of caudal tibia, 12.9; length of caudal metatarsus, 5 mm.

***Pseudophasma marmoratum* (Redtenbacher)**

1906. *Phasma marmorata* Redtenbacher, Insektenfamilie der Phasmiden, I Lief., p. 119. [♂, ♀; Murzo (= Muzo), [Boyacá]; Antioquia; Santa Fé de Bogotá, [Cundinamarca], Colombia; Rio Grande do Sul, [Brazil]; Cumbase, Peru; Ecuador.]

Villavicencio, Intendencia del Meta. XII, 1918, (from A. Maria), 1 ♀.

***Pseudophasma bispinosum* (Redtenbacher)**

1906. *Ph[asma] bispinosus* Redtenbacher, Insektenfamilie der Phasmiden, I Lief., p. 122. [♂, ♀; Coca, Santa Inez, Ecuador.]

Susumuco, Cundinamarca, IX, 1917, (from A. Maria), 2 ♀.

Villavicencio, Intendencia del Meta, VI, 1919 and VII, 1918, (from A. Maria), 6 ♂, 5 ♀.

The largest female in the present series, from Susumuco, is 72.5 mm. in length; Redtenbacher gives 80 mm. as the length for his Ecuadorean material of this sex.

A single female from Villavicencio shows a striking color variation. In this specimen the anterior field of the wings is clay color, heavily and irregularly blotched with jagged patches of blackish bister, this increasing and almost completely suffusing the lateral portions proximad. This blotching gives the specimen a decidedly different facies, but closer examination shows it to

agree in all other respects with the normal individuals of the series, in which the anterior field of the wings varies from warm sepia to bister, showing few and indistinct flecks of darker brown.

Euphasma salpingus (Westwood)

1859. *Phasma salpingus* Westwood, Cat. Orth. Ins. Br. Mus., Phasminidae, p. 119, pl. XXXIII, figs. 3 and 3a. [♀; Bogotá,⁶¹ Colombia]

Villavicencio, Intendencia del Meta, V, 1919, (from A. Maria), 1 ♂.

Damasippus zymbraeus (Westwood)

1859. *Dmelytron zymbraeus* Westwood, Cat. Orth. Ins. Br. Mus., Phasminidae, p. 163, pl. xv, fig. 3, a to c. [♂, ♀; Magdalena, Colombia]

Mamatoco, Magdalena, XII, 1917, (M. A. Carriker, Jr.), 1 ♀.

This is a beautiful green phasmid, with radiate field of wings white, broadly bordered distad and more narrowly caudad with blackish.

Isagoras chocoensis new species (Plate IX, figure 27.)

This species appears to be closely related to *I. plagiatus* (Redtenbacher), of which we have before us material, recorded as that species, from French Guiana.⁶² It is probable that these species are subject to decided variation, as stated by Redtenbacher for the allied *I. phlegyas* (Westwood), but the different proportions noted for the Guianan material may indicate racial or even specific distinction. We also feel little assurance that the series upon which Redtenbacher based his *plagiatus*, from Brazil, Bolivia, Colombia and Panama, represents but one species, from what we have noted elsewhere of the general character of the work resulting in the Insektenfamilie der Phasminiden. Suffice it to say that *chocoensis* agrees in some respects more closely with the Guianan material recorded as *plagiatus*, than with Redtenbacher's description of that species.

⁶¹ The comment contained in footnote 60 applies to this specimen as well.

⁶² Sent in exchange to the author by Chopard. This material shows the tegmina and caudal limbs decidedly shorter than the measurements given by Redtenbacher. Length of body, ♂ 51.8–53.4, ♀ 70; length of tegmen, ♂ 4.7–4.8, ♀ 7.3–7.7; length of caudal femur, ♂ 8.4–9.4, ♀ 9.7–10.8 mm

The present male differs from the Guianan males referred to above in the proportionately longer mesonotum, with minute granules more regular and interspersed with larger granules laterad, which are more numerous and surpass in size the few homologous larger granules found in those individuals, while the tegmina are shorter, much more truncate and show a striking pale transverse band, and the limbs are heavier and proportionately more elongate.

The tegmina in their brevity show closer agreement with species of the *Stratocles* Division of the *Pseudophasminae*, but the character of the limbs indicates that *chocoensis* is a member of the *Prexaspes* Division. In fact the species is unquestionably a member of the genus *Isagoras*, showing apparently the maximum tegminal reduction.

Type.—♂; Boca Murindó, Intendencia del Chocó, Colombia. February 9, 1918. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 740.]

Size medium, form very slender, much as in *plagiatus*. Head almost smooth, surface showing a few subobsolete granules; cheek one and one-third times as long as eye; ocelli prominent, forming a triangle slightly broader than deep, median ocellus distinctly smaller than lateral ocelli. Antennae extending well beyond apices of wings, segments increasing greatly in length to near distal portion, which is briefly segmented. Pronotum almost smooth, with surface showing a few subobsolete granules, transverse sulcus distinct, cephalic portion with lateral and transverse sulcus near cephalic margin distinct. Mesonotum with a distinct medio-longitudinal sulcus, surface regularly supplied with numerous minute granules and with (eight and ten) irregularly placed heavy granules on each side. Mesosternum with surface granuloso-rugulose. Tegmina short, caudal margin transverse, rounding broadly into the sutural margin, shoulders low, bluntly and evenly rounded. Wings fully developed. Distal portion of abdomen missing. Limbs unarmed. Cephalic femora compressed, with dorso-internal carina moderately elevated. Median and caudal femora with dorsal and ventral margins carinate; ventral surface medio-longitudinally carinate, this weak on median femora, strong on caudal femora. Caudal metatarsus distinctly shorter than combined length of succeeding joints. Arolia moderately well developed.

Head, pronotum and mesonotum bister, the former with a suffusion of mummy brown about the ocelli, the latter with the larger lateral granules mummy brown. Antennae mummy brown proximad, cinnamon-buff in remaining portions, with intersections of the longer joints tinged with cinnamon-buff. Tegmina proximad bister, shading to snuff brown distad, dorsad with a narrow transverse band of pinkish buff before the shoulders, laterad in all but proximo-ventral and disto-dorsal portions buffy, washed

with kildare green. Wings with anterior field snuff brown, weakly mottled with bister distad and in median section, irregularly and narrowly marked with kildare green toward the costal margin; radiate field transparent, weakly tinged with saccardo's umber. Cephalic and caudal femora bister, median femora greenish buff, tibiae of all limbs deep olive buff.

Length of body, (approximated) 53; length of pronotum, 2.3; width of pronotum, 1.4; length of mesonotum, 8.3; length of tegmen, 4.1; length of wing, 27.5; greatest width of wing, 14.4; length of cephalic femur, 11.7; length of cephalic tibia, 11; length of caudal femur, 10.3; length of caudal tibia, 9.7; length of caudal metatarsus, 2.8 mm.

The type is unique.

HETERONEMINAE

***Bacteria apolinari* Hebard**

1919. *Bacteria apolinari* Hebard, Trans. Am. Ent. Soc., XLV, p. 161, pl. XIX, figs. 10 and 11. [♂; Susumuco, Cundinamarca, Colombia.]

Villavicencio, Intendencia del Meta, V, 1919, (from A. Maria), 1 ♂.

The present, somewhat larger, specimen is in a much better state of preservation than the type, measuring as follows: length of body, 109; length of head, 4; length of pronotum, 3.2, length of mesonotum, 28.8; width of mesonotum, 1.8; length of metanotum, including median segment, 18; length of median segment, 10.8; length of cephalic femur, 34.3; length of cephalic tibia, 38.8; length of median femur, 28.3; length of caudal femur, 35, length of caudal tibia, 39, length of caudal metatarsus, 7 mm.

***Libethra reservata* Brunner**

1907. *Ocn[ophila] reservata* Brunner, Insektenfamilie der Phasmiden, II lief., p. 315. [♂; Bogotá, [Colombia].]

Bogotá, Cundinamarca, IX, 1918, (from A. Maria), 1 ♂.

There appears to be little question but that the specimen at hand represents the same species described by Brunner as *Ocnophila reservata*, though that author's original description is wretchedly inadequate.

Comparison shows the present individual to differ only in the slightly shorter metanotum, median segment and limbs, which differences may easily be due to carelessness in measuring the type, as Brunner's work on the genus is even more glaringly superficial and evidently hurried than elsewhere in that monograph. In

our specimen the head has dark post-ocular bands, bordered dorsad by a slightly paler shade than the general pale brown and immaculate coloration of the other portions of the insect.

As we have already noted,⁶³ the genus *Ocnophila* Brunner was based on an aggregation of twenty-nine species, many of which represent distinct generic units. Compared with the genotype, the present insect is seen to differ in the much more elongate head and apex of subgenital plate, which shows a small but deep median emargination. The form of the head agrees fully with the usual type developed in *Libethra*, while the distal portion of the abdomen shows a similarity of general structure, though by no means as highly specialized, with distal abdominal tergite no wider than long.

As this species evidently belongs to the phylum which includes *Libethra* and not to the phylum which includes *Ocnophila* as properly restricted, we here assign *reservata* to the genus *Libethra*. Study of more material, we believe, will probably show that the insect is a member of a distinct generic unit. At the present time insufficient material is at hand to solve this problem, but we believe it best to transfer the species to the genus which includes forms of clearly nearer relationship. In fact the male before us might easily be supposed to represent some species of *Libethra* in one of the later instars preceding maturity. This, however, we believe is disproven by the well formed, strongly in-bent cerci, which in the in-bent portion taper strongly to their blunt apices and are thickly supplied with short stout chitinous teeth.

Length of body, 45; length of head, 2.8; width of head behind eyes, 1.7; length of pronotum, 2; width of pronotum, 1.6; length of mesonotum, 11.8; length of metanotum, including median segment, 7.3; length of median segment, 1.2; width of distal tergite, 1.7; length of cephalic femur, 12.3; length of caudal femur, 12.9; length of caudal tibia, 14.1; length of caudal metatarsus, 2.2 mm.

⁶³ Trans. Am. Ent. Soc., XLV, p. 162, (1919). Genotype, selected at that time, *O. integra* Brunner.

EXPLANATION OF PLATES

Plate VIII

(External genitalic figures enlarged, other external figures and those of concealed genitalic features greatly enlarged.)

- Fig. 1.—*Asemoblatta nana* new genus and species. Cephalic outline of male cephalic femur. Bogotá, Cundinamarca, Colombia. *Type*.
- Fig. 2.—*Asemoblatta nana* new genus and species. Distal outline of male tarsal claw and arolium. Bogotá, Cundinamarca, Colombia. *Type*.
- Fig. 3.—*Asemoblatta nana* new genus and species. Ventral outline of male subgenital plate. Bogotá, Cundinamarca, Colombia. *Type*.
- Fig. 4.—*Chromatonotus andagoyae* new species. Caudal outline of production of sinistral half of paired plate beneath male supra-anal plate. Andagoya, Antioquia, Colombia. *Type*.
- Fig. 5.—*Chromatonotus andagoyae* new species. Caudal outline of production of dextral half of paired plate beneath male supra-anal plate. Andagoya, Antioquia, Colombia. *Type*.
- Fig. 6.—*Sciablatta mamatoco* new genus and species. Ventral view of apex of male abdomen. Mamatoco, Magdalena, Colombia. *Type*.
- Fig. 7.—*Sciablatta mamatoco* new genus and species. Lateral view of male subgenital plate, showing lamellate and hinged style. Mamatoco, Magdalena, Colombia. *Type*.
- Fig. 8.—*Neoblattella antioquiae* new species. Ventral view of apex of male abdomen. Andagoya, Antioquia, Colombia. *Type*.
- Fig. 9.—*Ischnoptera flagellifer* new species. Ventral view of apex of male abdomen. Andagoya, Antioquia, Colombia. *Type*.
- Fig. 10.—*Ischnoptera flagellifer* new species. Ventro-caudal view of male supra-anal plate and specialization of paired plate beneath. Andagoya, Antioquia, Colombia. *Type*.
- Fig. 11.—*Ischnoptera imphicata* new species. Ventro-caudal view of male supra-anal plate and specialization of paired plate beneath. Villavicencio, Meta, Colombia. *Type*.
- Fig. 12.—*Xestoblatta micra* new species. Dorsal view of distal portion of male abdomen. Las Mesitas, Cundinamarca, Colombia. *Type*.
- Fig. 13.—*Xestoblatta micra* new species. Caudal view of male subgenital plate. Las Mesitas, Cundinamarca, Colombia. *Type*.
- Fig. 14.—*Xestoblatta festae* (Griffini). Dorsal view of distal portion of male abdomen. Murindo, Chocó, Colombia.
- Fig. 15.—*Xestoblatta festae* (Griffini). Ventral view of apex of male abdomen. Murindo, Chocó, Colombia.
- Fig. 16.—*Xestoblatta festae* (Griffini). Dorsal view of distal portion of male subgenital plate, showing the very high specialization of the styles, which are in large part hidden within the anal chamber. Murindo, Chocó, Colombia. (Magnification nearly twice that of figure 15, which includes the external aspect of this portion.)

Plate IX

- Fig. 17.—*Chromatonotus andagoyae* new species. Dorsal view of male pronotum. Andagoya, Antioquia, Colombia. Type. ($\times 7$)
- Fig. 18.—*Xestoblattu poecila* new species. Dorsal view of female pronotum. Villavicencio, Meta, Colombia. Type. ($\times 7$)
- Fig. 19.—*Euphyllodromia stigmatosoma* new species. Dorsal view of male. Andagoya, Antioquia, Colombia. Type. ($\times 3\frac{1}{2}$)
- Fig. 20.—*Muzoa simplex* new genus and species. Dorsal view of male. Muzo, Boyacá, Colombia. Type. ($\times 2$)
- Fig. 21.—*Muzoa simplex* new genus and species. Distal outline of male tarsal claws and arolium. Muzo, Boyacá, Colombia. Type. (Greatly enlarged.)
- Fig. 22.—*Paratropes metae* new species. Dorsal view of female pronotum. Villavicencio, Meta, Colombia. Type. ($\times 4$)
- Fig. 23.—*Thespis metae* new species. Dorsal view of male sinistral tegmen. Villavicencio, Meta, Colombia. Type. ($\times 1\frac{1}{2}$)
- Fig. 24.—*Carrikerella ceratophora* new genus and species. Cephalic outline of female head. Andagoya, Antioquia, Colombia. Type. ($\times 6$)
- Fig. 25.—*Carrikerella ceratophora* new genus and species. Lateral view of female abdomen. Andagoya, Antioquia, Colombia. Type. ($\times 3\frac{7}{10}$)
- Fig. 26.—*Carrikerella ceratophora* new genus and species. Dorsal view of first abdominal tergite of female. Andagoya, Antioquia, Colombia. Type. ($\times 4$)
- Fig. 27.—*Isagoras choocoensis* new species. Dorsal view of male tegmen. Boca Murindó, Chocó, Colombia. Type. ($\times 4\frac{1}{2}$)

Plate X

- Fig. 28.—*Asemoblatta nana* new genus and species. Cephalic outline of male head. Bogotá, Cundinamarca, Colombia. Type. ($\times 16$)
- Fig. 29.—*Hyporhcnoda metae* new species. Dorsal view of female. Villavicencio, Meta, Colombia. Type. ($\times 2$)
- Fig. 30.—*Hyporhcnoda metae* new species. Latero-internal view of female caudal tarsus. Villavicencio, Meta, Colombia. Type. ($9\frac{1}{2}$)
- Fig. 31.—*Hyporhcnoda litomorpha* new species. Dorsal view of female. Villavicencio, Meta, Colombia. Type. ($\times 2$)
- Fig. 32.—*Hyporhcnoda litomorpha* new species. Dorsal view of male. Villavicencio, Meta, Colombia. Allotype. ($\times 2$)
- Fig. 33.—*Phortioeca apolinari* new species. Dorsal view of male. Villavicencio, Meta, Colombia. Type. ($\times 2$)
- Fig. 34.—*Phortioeca apolinari* new species. Dorsal outline of female pronotum. Villavicencio, Meta, Colombia. Allotype. ($\times 2$)
- Fig. 35.—*Hypercompsa anolaima* new species. Dorsal view of male dextral tegmen. Anolaima, Cundinamarca, Colombia. Type. ($\times 10$)

DESCRIPTIONS OF NEW AND CRITICAL NOTES UPON
PREVIOUSLY KNOWN FORMS OF NORTH
AMERICAN OEDIPODINAE (ORTHO-
PTERA; ACRIDIDAE.

Second Paper

BY JAMES A. G. REHN

In the first paper of this series¹ we have presented some prefatory matter that applies with equal force to the present contribution, which represents a continuation of the same study.

A critical study of the forms which have been referred to the genus *Circotettix* by various authors has resulted in the accumulation of much information, a portion of which, however, will require more definite correlation with the entities which have been referred to the genus *Trimerotropis*. This will be done in the very near future. At this time we are presenting, solely, such critical comments brought forth by our work on the *Circotettix* section of the study, as it seems desirable to publish in advance of the entire revision.

The Generic Position and Geographic Races of Oedipoda carliniana
Thomas (*Circotettix carlinianus* of Authors)

A critical examination of the species which have been referred by authors to the genus *Circotettix*, shows most conclusively that we have a number of aggregations represented in that assemblage, and of these but few show sufficient affinity to be retained in restricted *Circotettix*, the genotype of which is, as originally stated by Scuddler,² *Oedipoda undulata* Thomas. I have been fortunate enough to be able to examine the unique type specimen of *undulata*, in the United States National Museum, and its real identity had not been suspected by any recent workers. We will discuss this on a succeeding page.

The first section which it is necessary to segregate is that containing the forms of the *carlinianus* type. This we find to represent a valid genus, showing slightly more affinity with the

¹ Trans. Amer. Entom. Soc., XLV, pp. 229 to 253, pls. XXVI to XXVIII, (1919).

² Bull. Geol. and Geogr. Surv. Terr., II, p. 265, (1876).

Old World genus *Bryodema* Fieber,³ than with true *Circotettix*. Of *Bryodema* we have before us a male of *B. tuberculata*,⁴ which is a species very closely related to the genotype (by monotypy), *B. baicalensis* Fischer. The similarity of wing structure and venation of *Bryodema* and the new genus is startling.

AEROCHOREUTES⁵ new genus

A genus sharing features of the Old World genus *Bryodema* Fieber and the North American *Circotettix*, but in the bulk of its characters nearer *Bryodema* than *Circotettix*. From *Bryodema* the present genus can be distinguished by the smooth genae (these substrumose in *Bryodema*) and the strangulate pronotum, which also has the prozona equal to about one-half the length of the metazona, the transverse sulci deeply impressed and the lateral lobes deeper than dorsal length of same. In *Bryodema* the pronotum is heavier, the disk more quadrate, the prozona about three-fifths as long as metazonal disk, the transverse sulci are relatively weakly impressed and the lateral lobes with greatest depth subequal to dorsal length of same. From *Circotettix* the new genus differs chiefly in having the wings non-papilioniform, all the superjacent radials of the same incrassate, instead of but a portion of the series, and the fastigium broader than long in the male sex. In all these features it is in accord with *Bryodema*.

Generic Characters.—Fully alate in both sexes. Form robust. Fastigium broad, width at least as great as length; frontal costa broad, sulcate ventrad of median ocellus; face subvertical in profile. Pronotum short, broad across metazona, moderately strangulate on prozona; prozona not exceeding one-half of length of metazonal disk; caudal margin of disk rectangulate; transverse sulci deeply impressed; lateral lobes of pronotum with depth greater than dorsal length of same. Tegmina surpassing apex of abdomen and apices of caudal femora, broad, coriaceous; marginal field broad; intercalary vein evident. Wings equal to tegmina in length; radiate field regular in type, non-papilioniform,

³ Lotos, III, p. 129, (1853).

⁴ Desert of Khorinskaya, Transbaikalia, Siberia. (Parschine.) [Hebard Collection.]

⁵ From ἀήρ *air*, and χορεύτης *choral dancer*.

peripheral margin of same but faintly or at most weakly sinuato-lobulate; anterior axillary vein weakly incrassate, not fusing with the posterior axillary vein; all superjacent radiate veins incrassate.

Genotype—*A. carlinianus* [*Oedipoda carliniana*] (Thomas).

***Aerochoreutes carlinianus* (Thomas)**

1870. [*Oedipoda*] *carliniana* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 81. [♂ ♀: Eastern Colorado.]

The genus is composed of one species, which is divisible into two well-marked geographic races, each occupying a considerable territory and their intergradation demonstrated in the material before us. Of these races, one (*carlinianus carlinianus*) is eastern and northern, occurring in the northern Great Plains, northern Rocky Mountains and central British Columbia, while the other, which is new (*carlinianus strepitus*), is a form of the Great Basin and Green River regions. The area of intergradation is discussed below.

***Aerochoreutes carlinianus carlinianus* (Thomas) (Plate XI, figs. 1 to 3.)**

We have taken material from Fort Collins, Colorado, as typical of this race.

This, the typical subspecies of *carlinianus*, when compared with *A. carlinianus strepitus*, described below, is characterized by having the general form shorter and proportionately more robust; tegmina broad and less attenuate, particularly at apices; wings less elongate and not subfalcate distad, the alar ulnar area relatively narrow, no wider than median area at distal three-fifths, interaxillary area of wings relatively broad and subequal in width; eyes proportionately smaller, less prominent when seen from the dorsal and cephalic aspects, and more ovoid and less elliptical in basal outline, the ventral margin approximately subangulate; fastigium proportionately broader. The figures illustrating these remarks present the differences more clearly than words. In the description of *A. carlinianus strepitus* we have presented an analysis of the differential features of that race, which will aid in the proper segregation of the two forms.

Aerochoreutes carlinianus carlinianus is a form of the higher Great Plains region, extending into the Rocky Mountains, typical material before us representing localities extending from as

far north as Garrison, Montana, south to Gray Creek, Colorado, east to Powderville, Montana, and Hecla, Wyoming. Atypical material showing weak tendencies toward the new subspecies is available from Blue Lake, Grand Coulee, Washington; Shoshone, Salmon City, Birch Creek, Springfield, Pocatello and Soda Springs, Idaho; Bozeman, Montana and Mammoth Hot Springs, Yellowstone National Park. Actual intermediates between the two races are before us from Chilcotin, British Columbia; La Chapples, Yakima River, Washington, and Salt Lake Valley, Utah. When the distribution of typical *carlinianus* is compared with that of the subspecies *strepitus*, it will be seen that the former is a more northern and eastern type, and that it is not stable nor fully typical in the Snake River country of Idaho. It is also in a stage of what might be called equal fusion with *A. c. strepitus* in regions as related to the Snake River country as the Salt Lake Valley district, and to the Great Basin region as the Columbia Plains (Yakima River) and the dry interior of British Columbia (Chilcotin).

Aerochoreutes carlinianus strepitus⁶ new subspecies (Plate XI, figs. 4 to 6.)

A strikingly marked geographic race of *carlinianus*, in its typical form inhabiting the Great Basin and Green River regions, differing from typical *carlinianus*, as delimited above, in the following features: Eyes larger, more prominent when seen from the dorsal and the cephalic aspects; tegmina longer and more slender, relatively quite slender at apices; wings elongate, anterior and axillary fields much produced, apical section subfalcate; ulnar area of wings wider than in *carlinianus carlinianus*; interaxillary area of wings relatively narrow. These features are more accentuated in the male than in the female sex.

Type.—♂; Prince Royal Canyon, Star Peak Range, Humboldt County, Nevada. Elevation, 4500 to 5000 feet. September 16, 1919. (Rehn and Hebard.) [Hebard Collection, Type no 766.]

The following features are chiefly comparative with *A. c. carlinianus*.⁷ Form more elongate, due to greater length of tegmina and wings. Head with eyes more prominent from dorsum and from cephalic aspect, in latter view weakly but apparently elevated above level of fastigium: fastigium

⁶ *Strepitus*, *clattering*.

⁷ Comparisons made with male from Fort Collins, Colorado, (Dyar and Caudell), [Hebard Cln.].

proportionately narrower: eyes in basal outline, in lateral view, deeper and more elliptical, less sharp ovoid ventrad. Pronotum with stragulation slightly less marked: caudal angle of disk less acute produced and subrectangulate. Tegmina surpassing apex of abdomen by approximately the dorsal length of pronotum, and surpassing apices of caudal femora by approximately the combined length of head and pronotum, in shape more elongate with distal section moderately attenuate. Wings more falcate attenuate distad (see figure 4), apex of axillary field much more obliquely arcuato-lobulate: posterior ulnar area broad, the ulnar vein moderately sigmoid and not subparallel to anal vein as in typical *A. c. carlinianus*, ulnar area at three-fifths of length nearly twice as wide as adjacent portion of median area: interaxillary area relatively narrow compared with post-axillary area, narrowest point at two-thirds of wing length: radiate field of wing with margin more evidently sinuato-lobate.

Allotype.—♂; Same data as type. [Hebard Collection].

The female sex shows the same characters of differentiation as the male sex, although to a slightly less marked degree.

The coloration of the species as a whole will be discussed at a later date in a study of this and related genera. No marked color features differentiate the new subspecies. The infusate area present on the proximal section of the wing in the majority of specimens of *A. carlinianus carlinianus* is rarely indicated in *A. c. strepitus*, but it is by no means a fixed feature in series of typical *carlinianus* and is not a diagnostic feature of that subspecies. In *car. carlinianus* from Garrison, Montana, it may be evident or absent. In atypical individuals of the same form from the Snake River region, Idaho, it is almost always absent, and here conditions of aridity nearer akin to those prevalent in the area of distribution of *A. c. strepitus* may be the cause. At all events the presence or absence of wing cloud infuscation is not a subspecific feature in this species. In the series of *strepitus* we find the wing cloud weakly indicated in one topotype and more evident in one female from Wells, Nevada, tendencies or evident clouds indicated in all or nearly all from Green River, Wyoming; Grand Junction, Colorado, and Milford, Utah. This clouding is entirely independent of the pronounced pencilling of the radiate veins of the wing, which is found without exception in all specimens of the species.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
<i>A. car. carlinianus</i>				
♂, Fort Collins, Colorado.....	32	7.3	27.8	14.6
♂, Fort Collins, Colorado.....	31.5	8	28	14.8
♂, Garrison, Montana.....	25	6.4	24.4	12.7
♂, Garrison, Montana.....	29.3	7	25.5	13.4
♀, Fort Collins, Colorado.....	33.8	7.8	30.5	15.5
♀, Garrison, Montana.....	32.3	7.4	29	14.6
♀, Garrison, Montana.....	34	7.5	27.9	15

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
<i>A. car. strepitus</i>				
♂, Prince Royal Canyon, Nevada, type	30.5	6.9	30.7	14.5
♂, Prince Royal Canyon, Nevada, paratype	30	7	31	14
♂, Prince Royal Canyon, Nevada, paratype	33.7	7.4	33.2	15.3
♂, Grand Junction, Colorado	31.5	7	32.2	15
♀, Prince Royal Canyon, Nevada, allotype	37.4	7.9	34.2	16.2
♀, Prince Royal Canyon, Nevada, paratype	34.5	6.6	30.2	14.6
♀, Prince Royal Canyon, Nevada, paratype	37.2	8	36.2	16
♀, Grand Junction, Colorado	39.2	8.1	36.7	17.5

We have selected as paratypes a series of twenty-eight males and twenty-five females from the type locality. Aside from one female, which shows some approximation to *A. c. carlinianus* in wing characters, this series is uniform and thoroughly typical of the new subspecies. This one individual exhibits one of the reversal tendencies occasionally seen in individuals of almost any geographic race, when extensive series are examined, and which are clearly explicable as genetic influences. It is possible that *strepitus* is a more recent type than *car. carlinianus*, as its present area of distribution in large part was occupied in recent geologic times by Lakes Bonneville and Lahontan. It is equally possible that originally it was driven into the basin ranges by these bodies of water, and that by the process of survival individuals with longer wings, and probably better power of flight, formed the beginnings of this race, which may have repopulated the flat lands and valleys when the lakes subsided through evaporation.

The new subspecies is a Great Basin and Green River Valley form, typical east to Grand Junction, Colorado; north to Green River in Wyoming, Montello, Wells, Carlin and the Star Peak Range in Nevada, the only locality to the southward represented in the material before us being Milford, Utah. Atypical *strepitus* is before us from North Park, Colorado; Laramie, Rawlins and

Worland, Wyoming. Intermediates between the two races have been discussed under *A. c. carlinianus*. The occurrence of atypical *strepitus* at Worland, in the Big Horn Valley, at Rawlins, Wyoming, and North Park, Colorado, on the plains of the upper North Platte, and at Laramie on the Laramie Plains, is correlated with the known occurrence of Great Basin influences in the Big Horn Valley and the upper North Platte region.

Specimens Examined: 141; 67 ♂, 74 ♀.

Typical A. carlinianus strepitus

WYOMING: Green River, Sweetwater County, elevation 6050 to 7000 feet, VIII, 3, 1910, (R. & H.; on bare ground between scattered sage and other bushes on flats and talus slopes of valley rim), 2 ♂, 4 ♀.

COLORADO: Grand Junction, Mesa County, elevation, 4700 to 4800 feet, IX, 8, 1909, (R. & H.; on bare ground with scattered chenopodaceous bushes and very sparse grass), 1 ♀; no date, 2 ♂, 2 ♀, [Hebard C'n.].

UTAH: Tintic, Juab County, elevation, 4500 feet, IX, 6, 1909, (R. & H.; among stones on bare slope), 1 ♂. Milford, Beaver County, elevation 4900 to 5000 feet, IX, 5, 1909, (R. & H.; on bare ground between scattered sage brush), 4 ♂, 7 ♀.

NEVADA: Montello, Elko County, IX, 19, 1919, (R. & H.; on alkali encrusted adobe flat with scattered *Sarcobatus* bushes, one individual only seen), 1 ♂. Wells, Elko County, IX, 18, 1919, (R. & H.; very few in open spots among sage on adobe plain rising to foothills), 5 ♀. Carlin, Elko County, IX, 17, 1919, (R. & H.; on bare soil with small rock fragments on low rounded sage brush clothed hills), 1 ♂, 2 ♀. Prince Royal Canyon, Star Peak Range, Humboldt County, elevation 4500 to 5000 feet, IX, 16, 1919, (R. & H.; common and noisy on canyon slopes, these chiefly of blue gray limestone with scattered sage cover), 20 ♂, 26 ♀, *type*, *allotype* and *paratypes*.

Atypical A. carlinianus strepitus

WYOMING: Worland, Washakie County, VII, 10 to 15, 1911, VIII, 1911, some no date, (L. Bruner). 18 ♂, 14 ♀, [Hebard C'n.]. Rawlins, Carbon County, elevation 6750 to 6850 feet, VIII, 2, 1910, (R. & H.; locally on nearly bare adobe plain), 5 ♂, 8 ♀. Laramie, Albany County, 2 ♀, [Hebard C'n.]. Intermediates between *A. carlinianus carlinianus* and *A. carlinianus strepitus*⁸

BRITISH COLUMBIA: Chilcotin, VII, 16, 1920, (E. R. Buckell), 2 ♂, 2 ♀, [A. N. S. P.].

WASHINGTON: La Chapples, Yakima River, VII, 16, 1882, 1 ♂, [Hebard C'n.].

UTAH: Salt Lake Valley, 1878, 1 ♂, 1 ♀, [Hebard C'n.].

The Groups of the Genus Circotettix

The genus *Circotettix*, as now limited, is composed of five sections, which may be referred to as (1) the Undulatus Group, (2) the Rabula Group, (3) the Crotalum Group, (4) the Thialassinus

Group and (5) the Shastanus Group. The first of these contains solely *C. undulatus* (Thomas), while the fourth is made up of the single species *thalassinus* Saussure. The Shastanus Group is composed of two species, *shastanus* Bruner and *splendidus* Rehn and Hebard, the exact relationship of which species is under investigation. The Rabula Group is more complex and is treated in detail below, where also we have given a section on the Cro-talum Group. Quite a few of the species which have been referred to the genus *Circotettix* we now know do not belong to that genus, but their exact affinities are not easily determined, and investigations along these lines are now in progress.

The Identity of Oedipoda undulata Thomas, Genotype of the Genus *Circotettix*

In the collection of the United States National Museum there is a female specimen labelled "Oedipoda undulata. Col. Terr. Type." This individual has been dried from alcohol and it is type number 1088 U. S. N. M. There is every reason to believe this is one of the original specimens and in all probability the only one extant. Fully agreeing with the description as it does, its selection as the lectotype of the species is thoroughly justified. Thomas gave no indication of the number of specimens examined by him, although he supplied measurements of both sexes. This specimen shows that the following synonymy is necessary.

***Circotettix undulatus* (Thomas)**

1872. *Oe[dipoda] undulata* Thomas, Ann. Rep. U. S. Geol. Surv., v, p. 460.

[♂ ♀; "Colorado and Wyoming east of the mountains."]

1888. *C[ircolettix] lobatus* Saussure, Addit. Prodr. Oedipod., p. 65, pl. fig. 5.
! ♀; Colorado.]

1890. *Circotettix lapidicolus* Bruner, Proc. U. S. Nat. Mus., xii, p. 75. [♂ ♀;
(Salmon River Mountains west of) Salmon City, Idaho.]

1900. *Circotettix thalassinus* Scudder, Psyche, ix, p. 138. (Not of Saussure.)

The synonymy of *lobatus* and *lapidicolus* was correctly made by Scudder.⁸ The type material of *lapidicolus*⁹ is now before us, from the Hebard Collection, and the synonymy is beyond question. Saussure's erection of *lobatus* was in every probability due to Scudder's wrong interpretation of *undulatus*, which has been universally followed. Saussure had the two species before

⁸ Psyche, ix, p. 138, (1900).

⁹ See Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 66, (1912).

him, but unfortunately he described the wrong one. Scudder's interpretation of *thalassinus* is incorrect, a Nevada specimen so labelled and referred to by him now being before us. The greenish blue tinge of the wings in this and certain other individuals probably misled him. True *thalassinus* is a very different species of which we have studied considerable series.

The Rabula Group of the Genus Circotettix

This group is made up of a single widely distributed species, ranging from Canada to southern New Mexico in the Cordilleran and adjacent regions, and divisible into three geographic races, one of which is new.

Circotettix rabula Rehn and Hebard (*Circotettix undulatus* of most authors, not of Thomas).

1906. *Circotettix rabula* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1906, p. 393, figs. 13 and 14. ♂ ♀; Mammoth Hot Springs, Yellowstone National Park, Wyoming!

The three geographic races of this species are as follows:

Circotettix rabula rabula. A northern form occurring in the United States in the Transition and upper portion of the Upper Sonoran Zones from Montana to Colorado, in Canada ranging into the Boreal Zone.

Circotettix rabula nigrafasciatus. A form occurring over a considerable portion of the Upper Sonoran Great Plains in South Dakota, Nebraska, Colorado and Kansas.

Circotettix rabula altior new subspecies. A form of the Boreal Zone within the United States, typical from northern Colorado to southern New Mexico.

Intergradation between these races is established by the extensive material before us, summarized discussion of which is given below.

Circotettix rabula rabula Rehn and Hebard (Plate XI, figs. 7 to 9.)

This the typical race is characterized within the specific assemblage by having a generally weaker and more broken wing-band than in *C. rabula nigrafasciatus*, shorter and broader wing than in same, with an average blunter apex; broader tegminal apex and more heavily incrassate radiate veins of the wing. From *C. rabula altior* the present race differs in the proportionate-

ly larger head, larger general size, broader fastigium, in the pronotum being as an average broader cephalad and less decidedly deplanate caudad on disk, lateral angles hardly marked on metazonal disk; caudal tibiae usually pale.

Single Type.¹⁰—Figured ♀; Summit of hills at head of Mammoth Hot Springs, Yellowstone National Park, Wyoming; elevation, 7000 feet. August 8, 1904. (M. Hebard.) [Hebard Collection, Type no. 72.]

Fully typical material of this subspecies is before us from localities extending from Glenora, British Columbia (58° N, 131° W), south to northern Colorado (Dutch George and Virginia Dale) and northern Utah (Ogden Canyon, City Creek Canyon, Salt Lake Valley and Logan); west to eastern Idaho (Salmon City and Henry Lake), east to eastern Montana (Glendive and Powderville). Atypical material showing tendencies toward *C. rabula nigrafasciatus* is present from northeastern Wyoming (Newcastle) and northwestern Nebraska (Bad Lands of Sioux County and Gordon); similarly graded material showing tendencies toward *C. rabula altior* is before us from Hecla, Wyoming, and Maple Peak, Salt Lake County and Cedar Mountains, Iron County, Utah. Material intermediate between *C. rabula rabula* and *C. rabula nigrafasciatus* represents localities in southern Manitoba (Aweme and Treeshank) and the Black Hills region of South Dakota. Similarly intermediate material between *C. rabula rabula* and *C. rabula altior* is from extreme southern Montana (West Gallatin Canyon), the Big Horn Mountains, Wyoming, southwestern Wyoming (Grade Canyon), northern (Park City) and eastern (Sierra La Sal) Utah, and southwestern Colorado (Dolores). It is necessary to have a clear conception of the topography of the country involved, to appreciate the relativity of the localities illustrating the intergradation of *C. rabula rabula* and *C. rabula altior*. This is due to the fact that the former occurs at lower elevations and over broader expanses of country, while *altior* is typically a form of circumscribed distribution in country of considerable elevation and in areas apparently disconnected.

¹⁰ Selected by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 106, (1912).

*Localities Represented in Material Examined**Typical Circotettix rabula rabula*

BRITISH COLUMBIA: Glenora. ALBERTA: Fort McLeod. MONTANA: Spire Rock, Billings, Forsyth, Powderville and Glendive. WYOMING: Mammoth Hot Springs (*type locality*), Worland, Rawlins, Centennial Valley and Laramie. COLORADO: Dutch George, Virginia Dale. IDAHO: Salmon City, Henry Lake and Soda Springs. UTAH: Logan, Ogden Canyon, Salt Lake Valley and City Creek Canyon.

Atypical *Circotettix rabula rabula* toward *C. rabula nigrafasciatus*

WYOMING: Newcastle. NEBRASKA: Bad Lands in Sioux County, Gordon. Intermediates between *Circotettix rabula rabula* and *C. rabula nigrafasciatus*. MANITOBA: Aweme, Treesbank. SOUTH DAKOTA: Rapid City, Hot Springs.

Atypical *Circotettix rabula rabula* toward *C. rabula altior*

WYOMING: Hecla. UTAH: Maple Peak in Salt Lake County, Cedar Mountains in Iron County.

Intermediate between *Circotettix rabula rabula* and *C. rabula altior*

MONTANA: West Gallatin Canyon. WYOMING: Big Horn Mountains Grade Canyon in Sublette Range. COLORADO: Dolores. UTAH: Park City Sierra La Sal.

Circotettix rabula nigrafasciatus Beamer (Plate XII, figs. 10 to 12.¹)

1917. *Circotettix nigrafasciata*¹¹ Beamer, Bull. Univ. Kansas, XVIII, no. 1, p. 123, fig. 108. [♂ ♀; Kansas (Graham, Rooks, Logan, Gove, Trego and Barber Counties are indicated on accompanying chart by circles).]

We have before us two male and two female paratypes from Graham, Gove, Rooks and Trego Counties, Kansas, received in exchange from the University of Kansas, Entomological Museum. The typical series consisted of twenty-nine males and sixteen females, according to Beamer.

Single Type (here selected).¹²—♂; Trego County, Kansas. July 12, 1912. (F. X. Williams.) [University of Kansas, Entomological Museum.]

¹¹ This spelling, and this only, occurs three different places in Beamer's paper. This is unfortunate, but the consensus of opinion is that the original spelling must be retained, in view of the fact the author uses it consistently in three different places.

¹² Dr. S. J. Hunter has kindly supplied us with these data. This specimen was indicated by Beamer as the type, but only by labelling and not in print, so the present indication is the first published selection.

The chief differential features of the present subspecies, among the forms of *rabula*, are generally narrower tegminal apices, average more elongate wings with slightly more acute apices, weaker incrassation of the heavier radiate veins of the wings and the sharply indicated and generally complete and solid dark wing bar. These features other than the wing bar all show some variation in the series before us, and the race is not structurally as definite as *C. rabula altior*. The wing bar, however, is sharp and contrasted in typical material, and less marked and broken in atypical individuals.

This geographical race is a large, generally pale colored, one, typical over a considerable portion of the Great Plains region, particularly in the sandhill country, its area of distribution extending from south-central South Dakota (Capa) south to south-central Kansas (Barber County), west to extreme southeastern Wyoming (Pine Bluffs) and east-central Colorado (Pueblo and Gray Creek). Typically the subspecies is found north only to southeastern Wyoming (Pine Bluffs) and northwestern (Fort Robinson) and central (Dismal River and Broken Bow) Nebraska. Material from Capa, South Dakota is somewhat atypical, while a series of thirty-three of both sexes from Glen, Nebraska comprises mostly atypical individuals, although about twenty per cent are typical of *nigrafasciatus*. In all from Glen the wing bar is nearly typical of *nigrafasciatus*, the fluctuations being in other features. To understand the intergradation of *C. rabula rabula* and *C. rabula nigrafasciatus* in northwestern Nebraska it is necessary to visualize the physiography of the country. The Great Plains plateau there breaks off sharply on the north to the Bad Lands of the Cheyenne and White Rivers. In the latter type of country we find material of this species which is atypical of *rabula rabula*; on the surface of the Plains we find our representatives nearly or quite *rabula nigrafasciatus*, which ranges off to the south over the Plains and sandhills sections, where in preferred environments it occurs as low as 2480 feet (Broken Bow), approximately one thousand feet lower than the country in which atypical *rabula rabula* occurs in the Cheyenne and White River Bad Lands. On the slopes of the Sioux County, Nebraska escarpment, as at Glen, the material shows definite intergradation of the two races. At Capa, South Dakota atypical *nigrafasciatus* occurs as low as two thousand feet. To the westward *nigrafasciatus* is fully typical at least as far as Pueblo, Colorado,

nearly at the foot of the Rockies, while material from Gray Creek, Las Animas County, in the same state, at 6500 to 7000 feet, is nearly typical, with some showing weak tendencies toward *C. rabula rabula*.

Localities Represented in Material Examined

Typical Circotettix rabula nigrafasciatus

NEBRASKA: Fort Robinson, Sidney, Dismal River and Broken Bow. KANSAS: Chalk cliffs fifteen miles south of Collyer, Graham County, Rooks County, Gove County and Trego County. COLORADO: Wray, Limon, Pueblo and Gray Creek.

Atypical Circotettix rabula nigrafasciatus

SOUTH DAKOTA: Capa. NEBRASKA: Glen.

Circotettix rabula altior new subspecies (Plate XII, figs. 13 to 15).

This geographic race is a form of the higher parts of the Rocky Mountains and associated systems from northern Colorado to southern New Mexico, apparently occurring in disconnected areas of approximately similar conditions. It is almost entirely a form of the Boreal Zone within that territory, intergrading with true *rabula* to the northward and to the westward at the lower edge of its habitat. Intergradation with *C. rabula nigrafasciatus* has not been definitely established.

The present form may be characterized within the species by having a relatively small head, eyes smaller than in the other subspecies, fastigium narrower, particularly in the female, in the more deplanate metazonal portion of the pronotal disk, the tegmina quite broad and the caudal tibiae darker than in the other forms.

Type.—♂: Clouderoft, Sacramento Mountains, Otero County, New Mexico. Elevation, 8600 to 8700 feet. June 17, 1902. (H. L. Viereck.) [Academy of Natural Sciences of Philadelphia, Type no. 5378.]

The following features are chiefly comparative with *C. rabula rabula* and *C. rabula nigrafasciatus*. Size small: form as a whole more compressed and less robust. Head proportionately smaller when compared with greatest pronotal width; from cephalic aspect more compressed, greatest width across genae contained one and one-half times in greatest depth of head, instead of approximately one and one-third times as in *rabula rabula*: fastigium appreciably narrower, its greatest width subequal to two-thirds of greater length of same, instead of approximately subequal: eyes smaller, although

¹ *Altior*—higher.

equally prominent, basal outline more elliptical. Pronotum with strangulation of prozona more decided in proportion to metazonal disk width; metazonal portion of pronotal disk as a whole more deplanate, with lateral (humeral) shoulders more evident and less broadly rounded. Tegmina moderately broad, as a whole more subequal in width, apical section less narrowed. Wings ample.

Allotype.—♂; Same data as type. [Acad. Nat. Sci. Phila.]

The female sex shows the same features of differentiation as the male, but the fastigial difference is less decided and the pronotal contrasts not as marked.

Coloration showing no distinctive features of differentiation from the other subspecies, although averaging more infumate or even blackish. Wing bar never solidly marked nor as strongly evident as in *C. rabula nigrifasciatus*, but always of the clouded type, intensified toward the margins and weak mesad, found in *rabula rabula*, distal portion of wing typically weakly infumate. Caudal tibiae with a pale, complete or incomplete, proximal annulus, elsewhere bister to mummy brown, rather pale in postmedian section; tibial spines ochraceous-tawny to pale bister proximad.

Environmental influences on base coloration are evident. Specimens from Evanston, Wyoming, are very pale with occasionally subobsolete wing bars. Glenwood Springs material is as a whole brownish and of a uniform tone. Clouderoft material and that from Tesuque Creek, in the Santa Fé Rockies, is more uniform blackish, although some of the Clouderoft series are very pale, as pale as average *C. rabula rabula* from its type locality (Mammoth Hot Springs, Yellowstone National Park). Immediate environment is probably the controlling factor, as is quite clearly the case in certain species of *Trimicrotropis*.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Length of caudal femur
♂					
Clouderoft, New Mexico, <i>type</i> . .	24.8	5.5	4.9	27	12.3
Clouderoft, New Mexico, <i>para-</i> <i>type</i>	24.9	6	5	28	12.2
Clouderoft, New Mexico, <i>para-</i> <i>type</i>	24	6	5	28.6	12.6
Tesuque Creek, New Mexico . .	23	6.2	5	26	11.4
Tesuque Creek, New Mexico . .	26.2	6.1	5.2	30	12.9
♀					
Clouderoft, New Mexico, <i>allo-</i> <i>type</i>	27.2	6.9	5.2	28	13.5
Clouderoft, New Mexico, <i>para-</i> <i>type</i>	28.6	6.6	5.4	27.9	13.2
Clouderoft, New Mexico, <i>para-</i> <i>type</i>	32.2	6.7	5.2	28.9	13
Tesuque Creek, New Mexico . .	32.8	6.9	5.6	29.2	13.6

We have selected as paratypes a series of fifteen males and sixteen females from the type locality, the data for which are as follows: June 16 to 20, 1902, (H. L. Viereck), [Academy of Natural Sciences of Philadelphia], nine males, four females; July 15, 1907, (Rehn and Hebard), [Hebard Collection and Academy of Natural Sciences of Philadelphia], six males, twelve females. The color variation of this series is very considerable, a few notes on which are given above.

In an atypical condition this race occurs as far northwestward as southeastern Wyoming (Evanston), but the majority of the atypical individuals are from localities along or below the lower border of the Boreal Zone in Colorado and northern New Mexico. Atypical material from Evanston is, as mentioned above, quite pale in coloration. Material from 9700 feet on Pike's Peak is virtually typical, that from Manitou at 6400 to 6700 feet atypical, as is also a Cripple Creek series. An extensive series of twenty-two males and thirty-four females from Glenwood Springs, Colorado is atypical. A single male from Silver Lake, Utah (9700 feet), as would be expected from the elevation, is typical, while three males and four females from Park City, Utah (about 7000 feet) are intermediate between *C. rabula rabula* and *C. rabula altior*. A series of twenty-three males and sixteen females from Jemez Hot Springs, New Mexico, are virtually atypical, although a few could be called intermediates, while a series of the same numbers of individuals of each sex from Fort Wingate, New Mexico, is similar in character. A single female from the Big Horn Mountains, Wyoming is intermediate, as is also one male from West Gallatin Canyon, Montana. A single female from Dolores, Colorado, sixteen males and twenty-six females from Grade Canyon, Sublette Range, Lincoln County, Wyoming, and five males and twelve females from Sierra La Sal, Utah, are clearly intermediates.

Specimens Examined: 197: 103 ♂, 94 ♀.

Typical *Citrotettix rabula altior*

COLORADO: Bruinerd Park, 10,500 feet, VIII, 28, 1899, 1 ♂, 1 ♀, [Hebard Cln.]. Georgetown, Clear Creek County, 8500 to 9500 feet, VII, 12 to 13, 1877, 1 ♀, [Hebard Cln.]. Tennessee Pass, Eagle County, 10,240 feet, IX, 10, 1909, (R. & H.): occasional on hill slope covered with sage and short scat-

(tered grass), 5 ♂, 3 ♀. Mountain View, Pike's Peak, El Paso County, 9705 feet, VIII, 20, 1904, (Hebard), 1 ♂, 1 ♀.¹¹

NEW MEXICO: Beulah, San Miguel County, VIII, 17, (H. Skinner), 3 ♂, 1 ♀, [A. N. S. P.];¹⁵ (W. P. Cockerell), 1 ♂, [A. N. S. P.];¹⁶ Top of Las Vegas Range, San Miguel County, VI, 28, 1902, (H. L. Viereck), 1 ♂, [A. N. S. P.]. Tesuque Creek, west slopes of Lake Peak, Santa Fé Range, Santa Fé County, 7900 feet, VII, 27 to 28, 1919, (R. & H.; in moderate numbers in open gravelly spots or along roads in forest region), 8 ♂, 2 ♀. Rio Ruidoso, White Mountains, 6500 feet, VII, 30, (C. H. T. Townsend), 1 ♂, 1 ♀, [A. N. S. P.]. South Fork of Eagle Creek, White Mountains, 8000 to 8300 feet, VIII, 19 to 20, (C. H. T. Townsend), 2 ♂, [A. N. S. P.]. Cloudcroft, Sacramento Mountains, Otero County, June 16 to 20, 1902, (H. L. Viereck), 10 ♂, 5 ♀, *type, allotype and paratypes*, [A. N. S. P.];¹⁷ July 13, 1907, (R. & H.), 6 ♂, 12 ♀, *paratypes*, [Hebard Cln. and A. N. S. P.].¹⁸

UTAH: Silver Lake, Wasatch Mountains, Salt Lake County, VII, 14, (H. Skinner), 1 ♂, [A. N. S. P.].

Atypical Circotettix rabula altior

WYOMING: Evanston, Uinta County, VIII, 2 and 3, 1920, (H. Skinner), 2 ♂, 1 ♀, [A. N. S. P.].

COLORADO: Ward, Boulder County, VIII, 26 to 27, 1901, (L. Bruner), 1 ♂, 1 ♀, [Hebard Cln.]. Swift Creek, Custer County, (Cockerell), 1 ♀, [Hebard Cln.]. Manitou, 6400 to 6700 feet, VIII, 23, 1904, (Hebard), 1 ♂, 1 ♀, [Hebard Cln.]. Cripple Creek, VIII, 19, 1904, (Hebard), 4 ♂, [Hebard Cln.];¹⁹ Glenwood Springs, 5800 to 7100 feet, IX, 9, 1909, (R. & H.; on slopes with juniper and some pinyon, abundant above 6000 feet, particularly in open spots), 7 ♂, 30 ♀; VII, 12, 1920, (H. Skinner), 2 ♀, [A. N. S. P.].

NEW MEXICO: Sundia Mountains, IX, 14, 1909, 1 ♂, [Hebard Cln.]; VI, 14, 1909, (rim rock in oak chaparral), 1 ♂, [Hebard Cln.]. Jemez Hot Springs, Sandoval County, 7500 feet, VIII, 1909, VI, 9, 1914, VI, 24 to 29, VII, 2 to 12, VIII, 8 to 20, IX, 7 to 16, 1912 and 1913, (John Woodgate), 23 ♂, 14 ♀, [Hebard Cln.]. Fort Wingate, McKinley County, VI, 18 to 30, VII, 4 to 31, VIII, 4 to 17, IX, 3 to 25, X, 3, 1910, (John Woodgate), 23 ♂, 17 ♀, [Hebard Cln.].

The Crotalum Group of the Genus Circotettix

Provisionally we are using this group name to include two species having deep glaucous blue caudal tibiae. They possess some other features in common, but, when our study work is bet-

¹¹ Recorded by Rehn and Hebard (Proc. Acad. Nat. Sci. Phila., 1906, p. 393, (1906)) as *Circotettix undulatus*.

¹⁵ Recorded by Rehn (Ibid., 1902, p. 722, (1903)) as *Circotettix undulatus*.

¹⁶ Recorded by Rehn (Ibid., 1904, p. 569, (1904)) as *Circotettix undulatus*.

¹⁷ Recorded by Rehn (Proc. Acad. Nat. Sci. Phila., 1902, p. 722, (1903)) as *Circotettix undulatus*.

¹⁸ Recorded by Rehn and Hebard (Ibid., 1909, p. 154, (1909)) as *Circotettix undulatus*.

¹⁹ Recorded by Rehn and Hebard (Ibid., 1906, p. 393, (1906)) as *Circotettix undulatus*.

ter in hand, the association may be found unwarranted and the removal of one of the forms (*crotalum*) to the *Shastanus* Group necessitated. The species *coconino* very nearly approaches *C. rabula altior*, in fact in some respects seems almost a replica of it, with certain differences discussed below, and through these two entities it would seem that the common ancestry of these groups (i. e. the *Rabula* Group and the *Crotalum* Group) is evident. Groups we are calling these, as they can readily be distinguished by the yellow to brownish caudal tibiae of the *Rabula* assemblage, and the deep glaucous blue of the one here treated; also we have no evidence that *rabula* and *coconino* intergrade, although such may be the case. The true position of *crotalum*, as intimated above, may be found eventually to be in the *Shastanus* Group, the forms of which at present so placed have paler glaucous caudal tibiae. However, at this writing the association of *coconino* and *crotalum* seems best, particularly as *shastanus* has a much more complex secondary venation of the wings, a single axillary vein in the same and a more compressed general form. From *splendidus*, another member of the *Shastanus* Group, the slender general form will at once separate *crotalum*.

Circotettix coconino new species. (Plate XII, figs. 19 to 21.)

A stocky robust form, with relatively short and broad tegmina and but little distal prolongation of the wings, the distal margin of the axillary field of the same well arcuate. Looking much like a deep glaucous blue tibiaed *C. rabula altior*, it, however, can be separated by the greater width proximad of the area of the median forks of the wing, which region is, by virtue of the shorter wings, much shorter and with fewer cross-veins. The eye, in basal outline, is also more elliptical and not sub-ovoid. The differences from *C. crotalum* are given under that species.

Type.—♂; Bill Williams Mountain, Coconino County, Arizona. September 14, 1917. (O. C. Poling.) [Hebard Collection, Type no. 767.]

Size medium; form robust (for the genus).

Head relatively narrow, greatest width across genae contained slightly less than one and one-half times in greatest depth of same; in profile with occiput and fastigial outline markedly bullato-arcuate, fastigio-facial angle narrowly rounded obtuse, faintly projecting; fastigium moderately broad,

roughly flask-shaped, greatest width contained one and two-fifths times in greatest length of same, lateral margins decided, moderately elevated, median carina distinct, less decided than lateral, continued weakly over occiput, lateral foveolae slightly elongate, trigonal, well impressed; frontal costa moderately broad, appreciably narrowed dorsad at junction with fastigium, where surface is impresso-foveolate; surface of costa deeply impressed about and for a distance ventrad of median ocellus; lateral carinae appreciably constricted at level of lower margin of median ocellus, markedly diverging thence ventrad. Eyes faintly elevated dorsad of fastigium seen from cephalic aspect, moderately prominent, large, in basal outline broad subelliptical-ovate.

Pronotum of type usual in genus, prozonal strangulation evident, although not pronounced; length of metazonal disk nearly twice as great as that of prozona, greatest width of metazonal disk equal to length of same with half of prozonal length; cephalic margin of pronotum faintly produced, caudal margin rectangulate with immediate angle very narrowly rounded; median carina evident but delicate and not markedly elevated, weakening caudad; surface of metazonal disk as a whole deplanate but showing some undulation in profile, cribroso-reticulate; transverse sulci well impressed; humeral metazonal shoulders distinct, faintly carinate cephalad. Lateral lobes of pronotum with their greatest dorsal length faintly less than greatest depth of same.

Tegmina surpassing apex of abdomen by approximately length of pronotum, broad, greatest width contained about four times in length of same; costal margin as a whole subarcuate with median flattening; distal margin obliquely subtruncate: intercalary vein decided, proximal equidistant from median and ulnar veins; anal field broad, at widest point nearly equal to two-fifths of greatest tegminal width. Wings relatively short and broad, depth of wing contained slightly under one and one-half times in greatest breadth of same, apical section moderately angulate, distal margin of anterior field oblique subtruncate, apex not at all falcate; axillary field with its peripheral margin moderately arcuate; peripheral margin of radiate field arcuately scalloped between subjacent radials: venation open and cross-veins relatively few; area of median forks quite broad proximad, narrowed distad, posterior branch proximad very closely approaching ulnar vein; ulnar vein as a whole moderately arcuate, ulnar area over twice as wide, at widest point, as adjacent portion of medio-ulnar area; posterior axillary vein weak; first, second and third superjacent radials incrassate.

Mesosternum with interspace slightly transverse, faintly narrower than width of one of the mesosternal lobes; metasternal interspace no wider than mesosternal, but shallower, and in consequence more transverse.

Caudal femora with apices almost reaching to apex of abdomen.

Allotype.—♀; Same data as type. [Hebard Collection.]

The characters here given are those of importance which differ from the description of the same features in the male sex.

Head faintly broader across genae. Fastigio-facial angle slightly less angulate than in male; fastigium faintly broader, median carina slightly less

evident than in male; frontal costa of form similar to male but broader throughout.

Tegmina surpassing apex of abdomen by approximately two-fourths of pronotal length, greatest width contained about four and one-quarter times in length of same. Wing with ulnar area at widest point equal to twice width of medio-ulnar area; incassation of axillary and three superjacent radials extremely slight.

Caudal femora with apices falling short of abdominal apex by faintly more than metazonal length.

General color as seen from dorsal surface dull cinnamon brown to deep mummy brown, the tegmina with three generally indistinct, irregular and incomplete transverse clouds of mummy brown to blackish areolate spots, the proximal cloud more evident than the others, the distal very much diffuse, and all variable in strength and opacity, although never solid nor in contrasting evidence. Disk of metazona occasionally solidly touched with ochraceous-tawny, this rarely well contrasted; rarely the entire pronotum has an overlay of fine blackish speckles. Lower face, lower portion of genae and mouth-parts passing from the dorsal color to drab gray to mouse gray. Eyes buckthorn brown to russet and prout's brown. Antennae obscurely multiannutate with ferruginous to tawny. Wings with disk apices yellow rarely to citron yellow; transverse bar never solid or sharply defined, always nebulous, weak mesad and more intense along or near the first, second and third superjacent radials and in the region of the humeral spur, in color the bar is mummy brown; distal section of wing very weakly infumate. The axillary, first, second and third superjacent radial veins may have their sections within the bar strongly infusate with mummy brown, or the yellow of the disk may continue along the vein itself for some distance toward the peripheral margin. Ventral surface blackish brown; paired subcircular areas of wood brown to buffy brown usually indicated on the mesosternal-mesopleural suture and laterad on the metasternum. Caudal femora with ventral sulcus solidly black except for a pregenicular pale ochraceous-tawny annulus, which is but weakly evident on the dorsal and lateral faces; dorsal and lateral faces with indications of the usual dark bars. Caudal tibiae acetin blue to tyrian blue, rarely as greenish as gobelin blue, passing to ochraceous proximad and there black clouded on internal face; tibial spines black tipped; caudal tarsi pale ochraceous-salmon to ochraceous-buff, dorsally marked with glaucous.

Measurements (in millimeters)

σ^7	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Bill Williams Mountain, Arizona, <i>type</i>	27	6.3	5.5	25.8	6.6	13.2
Bill Williams Mountain, Arizona, <i>paratype</i>	26.4	6.3	5.5	25.4	6.3	13

	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Greatest width of femur	Length of caudal femur
Bill Williams Mountain, Arizona, <i>paratype</i>	25	6 1	5	25 4	6	12 4
Bill Williams Mountain, Arizona, <i>paratype</i> ...	24 6	5 6	5	25 5	6 2	12 1
San Francisco Moun- tains, Arizona ...	25 6	6 3	5 6	26 6	6 3	12 9
Dewey, Arizona	26 5	5 8	5 1	24 9	6	12 8
Bright Angel, Arizona	27 8	6 6	5 7	29 6	7	14
Bright Angel, Arizona	27 5	6 9	5 8	29 4	6 8	13 4
♀						
Bill Williams Mountain, Arizona, <i>allotype</i>	29 5	6 3	5 5	26.7	6 2	13
Bill Williams Mountain, Arizona, <i>paratype</i> .	33 2	7.2	5 6	31	6 8	15 2
Bill Williams Mountain, Arizona, <i>paratype</i>	32 4	7	5 8	29 5	6 5	14 7
Bill Williams Mountain, Arizona, <i>paratype</i>	31 4	7	6	30 2	7 1	15 1
San Francisco Moun- tains, Arizona	32 5	7	5 7	31.2	7	13 9
Bright Angel, Arizona	32 5	7	5 9	31	7	14 5
Bright Angel, Arizona	33 4	7 3	5 9	32 5	7 1	14 6

We have selected as paratypes a series of fourteen males and twenty females bearing the same data as the type. This series, as a whole, is relatively uniform in size, and in the features of the species. The wing bar shows some variation in intensity and solidity, in general its fluctuation is solely one of intensification or recession, and its area remains the same and its margins as lacking in sharp definition.

Material of the species from Bill Williams Mountain, Flagstaff, San Francisco Mountains and Dewey is uniform in character, of similar general proportions, wing structure and pattern. The fastigium varies somewhat in width in the above series, but it is rarely sufficiently narrow to cause any confusion with *C. crotalum*, and in such cases the general, pronotal and tegminal features are diagnostic.

A series of nine males and ten females from the vicinity of the rim of the Grand Canyon at Bright Angel, Arizona, show a more elongate type of tegmina and wings than those from the other localities represented. This produces a generally more elongate appearance and an appreciable approach toward *C*

crotaulum, but this tendency is, apparently, not sufficient to indicate intergradation, although a representation from more localities in northern and northeastern Arizona may show such to be the case. Further collecting in that region must be done to clearly determine this matter.

The species inhabits open park-like areas scattered through forests of western yellow pine (*Pinus ponderosa* in northern Arizona. Its clattering is very decided.

Specimens Examined:²² 59: 27 ♂, 32 ♀.

ARIZONA: Bright Angel, Grand Canyon of the Colorado, Coconino County, 7000 feet, IX, 11, 1907, (Hebard), 5 ♂, 5 ♀, [Hebard Cln. and A. N. S. P.];²³ 6880 feet, VII, 29 to VIII, 2, 1906, (P. P. Calvert; on rim of canyon), 3 ♂, 2 ♀, [A. N. S. P.]; X, 6, 1919, (Hebard; in open park-like yellow pine forest in shallow valley back from edge of canyon), 1 ♂, 2 ♀: VII, 11, 1905, (H. Skinner), 1 ♂, [A. N. S. P.] San Francisco Mountains, Coconino County, 9000 feet, VII, 31, 1919, (R. & H.; in bare spots at upper limit of yellow pine forest), 1 ♂, 1 ♀. Flagstaff, Coconino County, VII, 3, 1 ♂, [Hebard Cln.] Bill Williams Mountain, Coconino County, IX, 14, 1917, (O. C. Poling), 15 ♂, 21 ♀, *type, allotype* and *paratypes*, Hebard Cln. and A. N. S. P.] Dewey, Yavapai County, IX, 9, 1917, (O. C. Poling), 1 ♂, [Hebard Cln.].

Circotettix crotaulum²⁴ new species (Plate XII, figs. 16 to 18.)

We have discussed above the general relationship of this species, and specific comparison here need be made only with *C. coconino*, described above, and *C. shastanus* Bruner. From *coconino* the present species differs in its more slender and elongate form, narrower fastigium, slightly more angulate fastigio-facial angle, slightly less prominent eyes, more elongate tegmina, with narrower anal field, more elongate and apically falcate wings, and the average greater development of the first, second and third superjacent radials of the wing. The caudal femora also average more robust. From *shastanus* the present species differs

²⁰ In addition to these specimens we have three males labelled "Albuquerque, N. Mex. 7-12-02. Osler" (recorded as *Circotettix undulatus* by Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 569, (1904)). These are clearly *coconino*, probably from some point in north-central Arizona, but certainly from nowhere near Albuquerque, New Mexico. At the previous writing Albuquerque was queried as the exact locality, but it is evident the locality is more erroneous than at first supposed.

²¹ Recorded by Rehn and Hebard (Proc. Acad. Nat. Sci. Phila., 1908, p. 391, (1908)) as *Circotettix undulatus*.

²² I. e. *a castanei*.

in its relatively more robust build, relatively larger head, somewhat broader anal field of the tegmina, the more falcate wing, which has two instead of a single axillary vein and a more open venation, and in the darker glaucous tone of the caudal tibiae. *Shastanus*, typically, is a more compressed insect with a smaller head in proportion to the prozonal section of the pronotum.

Type.—♂; Lee Canyon, Spring Mountains, Clark County, Nevada. Elevation, 8000 to 8500 feet. August 19, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 768.]

Size medium; form elongate, slender, body moderately compressed.

Head of average size, moderately deep in proportion to width, greatest width across genae contained one and one-half times in greatest depth of head; fastigium narrow, its greatest width contained slightly more than one and one-half in length of same, relatively open caudad, shallowly excavate with obscure median carina; fastigio-facial angle moderately produced, more evident than in *C. coconino*: frontal costa broad, narrowing dorsad, faintly constricted ventrad of median ocellus, obsolete on lower face, shallowly impressed about median ocellus, excavate for brief distance ventrad of same; lateral foveolae each an equilateral triangle in outline, very shallowly excavate. Eyes hardly prominent from cephalic aspect, hardly elevated, basal outline subovoid.

Pronotum moderately stragulate, greatest width across metazonal disk subequal to metazonal and one-half of prozonal length; metazona nearly twice as long as prozona: caudal margin of disk as a whole rectangulate, immediate angle rounded; median carina low but distinct, transverse sulci evident; metazonal disk weakly undulate; humeral angles of metazonal disk prominent but narrowly rounded. Lateral lobes of pronotum with greatest depth subequal to dorsal length.

Tegmina elongate, surpassing apex of abdomen by faintly more than length of head and pronotum combined, broad, greatest width contained slightly more than three and one-third times in the greatest length of same, appreciably narrowing in distal fifth, distal margin obliquely subtruncate; intercalary vein proximad equidistant from median and ulnar veins; anal field moderately broad, but distinctly narrower than in *C. coconino*, in greatest width (to anal vein) equal to less than one-third of greatest tegminal width. Wings moderately elongate, depth of wing contained one and three-fifths times in greatest breadth of same; apical section moderately falcate, distal margin of anterior field oblique subtruncate; axillary field with its peripheral margin oblique and weakly arcuate; peripheral margin of radiate field similar to but more weakly scalloped than in *C. coconino*: venation more complex and cross-veins more numerous than in *C. coconino*; area of median forks broad, narrowing distad, similar to same area in *coconino* but more elongate and its expansion less pronounced; ulnar area nearly three times as wide, at widest part, as adjacent portion of medio-ulnar area; posterior axillary vein weak, but still more evident than in *C. coconino*; first, second and third superjacent radials incrassate, the last more appreciably so than the others.

Caudal femora with apices falling short of apex of abdomen by faintly less than prozonal length.

Allotype.—♀; Same data as type. [Hebard Collection.]

The characters are those of importance which differ from the description of the same features in the male sex.

Head slightly broader across genae. Fastigio-facial angle distinctly less angulate than in male, the fastigial line in profile arcuate.

Tegmina surpassing apex of abdomen by length of pronotum, greatest width contained four and one-half times in greatest length of same; incision of anterior axillary vein, first, second and third superjacent radials extremely slight.

Caudal femora with apices falling short of abdominal apex by no more than the metazonal length.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Lee Canyon, Nevada, 8000-8500 ft., <i>type</i> ...	27.5	6.2	5.4	30.7	7	13
Lee Canyon, Nevada, 7200 ft., <i>paratype</i> ...	25	5.7	4.6	28.5	5.7	11.5
Lee Canyon, Nevada, 7200 ft., <i>paratype</i> ...	26.4	5.8	4.8	32	6.1	12.7
Charleston Peak, Nevada, 10,200 ft., <i>paratype</i> ...	26	6	5	31.5	6.5	12.9
♀						
Lee Canyon, Nevada, 8000-8500 ft., <i>allotype</i>	29.2	6.4	5.5	32	7	13.1
Lee Canyon, Nevada, 7200 ft., <i>paratype</i> ...	30 ²¹	5.4	4.8	27.4	5.5	12.2
Lee Canyon, Nevada, 8000-8500 ft., <i>paratype</i>	35.6 ²¹	7	5.8	33	6.2	14.1
Charleston Peak, Nevada, 10,200 ft., <i>paratype</i>	30.9	6.4	5.3	31.6	6.5	13.5

General color impression of dorsal and lateral surfaces ranging from drab or cinnamon-drab to nearly fuscous black, the whole general tone produced by an obscure "salt and pepper" mottling of light drab or ecru-drab to cinnamon-drab and mouse gray, with hair brown to blackish brown, the tegmina with the dark suffusions areolate and hardly distributed in the usual transverse bars, or at best obscurely so. Face and occasionally genae of the pale tone of the general mottling. Eyes buckthorn brown to prout's brown. Antennae obscurely annulate with the two tones of the general mottling.

²¹ Slightly abnormal in abdominal extension.

Wings with disk chalcedony yellow to amber yellow (in vast majority), rarely naples yellow; bar similar to that of *C. coconino* in form and extent, but more uniform in intensity, more solid and generally more sharply defined, in color mummy brown; distal portion of wings ranging from clear hyaline to very faintly infumate. Ventral surface ranging from isabella color and light brownish olive to fuscous-black with a wash of dusky dull bluish green; pale areas described on sternum of *C. coconino* indicated, but not invariably, in this species. Caudal femora with color as described for *coconino*, caudal tibiae deep orient blue to dark tyrian blue, otherwise as in *C. coconino*, caudal tarsi pinkish buff, lined dorsad with bluish.

We consider as paratypes the entire series before us (other than type and allotype)—forty-two males and fifty-four females, taken in Lee Canyon, Spring Mountains, Nevada, August 18 to 20, 1919, at elevations of from 7000 to 8500 feet, and one male and two females taken at 10,200 feet on Charleston Peak, Spring Mountains, Nevada, on August 19, 1919, all secured by Rehn and Hebard. This series shows, as is demonstrated in the above table, that the species varies individually very greatly in size, even at the same elevation in Lee Canyon; also that the form of the fastigium varies considerably in shape and in the relative proportions of the same, although this area is, when the series is considered as a whole, of a distinctly narrower type than in *coconino*. The basic coloration is variable, as the color description shows, but there appears to be some environmental correlation here. The material taken from seven thousand to seven thousand, two hundred feet is paler, more grayish in general tone; that from eight thousand to eight thousand, five hundred feet is more blackish,²¹ as is also that from Charleston Peak. This is probably due to responses to some environmental influences at the two localities. At seven thousand, two hundred feet we have a park-like region, of juniper and pinyon with sage brush, and open areas showing some bare gray limestone, much sunlight and strong reflection; at eight thousand to eight thousand, five hundred feet we have a region of yellow pine forest with small glades and some cut-over areas, but as a whole one of shadows and reduced light, with the limestone of the mountains largely mantled with needles and dry soil.

²¹ Several individuals from this elevation are as pale and as grayish as those from seven thousand, two hundred feet. In one case this is clearly due to the specimen being teneral, and a similar cause may be responsible for the others, although from our knowledge of the immediate locality restricted sections approximate the conditions found at seven thousand, two hundred feet.

The species is known only from the Spring Mountains of southern Nevada, an isolated mountain mass which rises from the surrounding desert valleys, i. e. Indian Spring on the north, Las Vegas on the northeast and east, Mesquite and Ivanpah on the south, Pahrump on the southwest and the Amargosa Desert on the west. The general level of these valleys is two thousand to three thousand, five hundred feet above sea-level, and the summit of Charleston Peak, the culminating point of the Spring Mountains, reaches eleven thousand, nine hundred feet. Ascending from the northeast, up Lee Canyon, by way of an old traction road over which timber had been hauled from a now abandoned saw-mill, we first encountered the present species of oedipodid at seven thousand feet, in a park-like region of juniper and piñon, where on bare spots with broken stony soil, often with dry scattered grass and low herbage, it was uncommon. From this elevation up it increased in local abundance. At eight thousand to eight thousand, five hundred feet in very dry open forest of western yellow pine, some douglas fir and western white pine, the insect was moderately numerous, preferably on bare surfaces with pebbles and large fragments of the blue gray limestone of which these mountains are largely composed. While a powerful flier, *crotalum* is not easy to capture chiefly for another reason, as, while not particularly wary, it has a crouching habit which permits a net to pass over it before, rising safely, it rattles off. It clatters much like members of the Rabula Group, but not quite so loudly, and in flight seldom rises more than a dozen feet, apparently not performing the aerial ballet of *C. undulatus* (*lobatus* of authors). As high as ten thousand, two hundred feet on the very steep and rocky slopes of Charleston Peak, *crotalum* was found, although there but a single colony, and this largely made up of immature individuals, was located on August 19.

Doubtless this insect occurs at suitable elevations and in proper environments on other ranges in southern Nevada, and probably adjacent desert ranges in California, but we are without definite positive information, although negative evidence, from our own observations, is available from certain localities in that general region.

Specimens Examined: 101; 41 ♂, 57 ♀.

NEVADA: Lee Canyon, Spring Mountains, Clark County, 7000 feet, VIII, 18, 1919, (R. & H.), 1 ♂, *paratype*; 7000–7200 feet, VIII, 19, 1919, (R. & H.), 1 ♂, 3 ♀, *paratypes*, 7200 feet, VIII, 20, 1919, (R. & H.), 10 ♂, 14 ♀, *paratypes*; 8000 to 8500 feet, VIII, 19, 1919, (R. & H.; moderately numerous on bare surfaces of pebbles and limestone fragments in open forest), 31 ♂, 38 ♀, *type*, *allotype* and *paratypes*. Charleston Peak, Spring Mountains, Clark County, 10,200 feet, VIII, 19, 1919, (Hebard; scarce on rocky and very steep slopes), 1 ♂, 2 ♀, *paratypes*.

EXPLANATION OF PLATES

PLATE XI

- Fig. 1.—*Aerochoreutes carlinianus carlinianus* (Thomas). Hecla, Wyoming. Male. Tegmen and wing. ($\times 2\frac{1}{2}$)
- Fig. 2.—*Aerochoreutes carlinianus carlinianus* (Thomas). Hecla, Wyoming. Male. Face. (Greatly enlarged.)
- Fig. 3.—*Aerochoreutes carlinianus carlinianus* (Thomas). Hecla, Wyoming. Male. Dorsum of head. (Greatly enlarged.)
- Fig. 4.—*Aerochoreutes carlinianus strepitus* new subspecies. Prince Royal Canyon, Star Peak Range, Nevada. Male (*type*). Tegmen and wing. ($\times 2\frac{1}{4}$)
- Fig. 5.—*Aerochoreutes carlinianus strepitus* new subspecies. Prince Royal Canyon, Star Peak Range, Nevada. Male (*type*). Face. (Greatly enlarged.)
- Fig. 6.—*Aerochoreutes carlinianus strepitus* new subspecies. Prince Royal Canyon, Star Peak Range, Nevada. Male (*type*). Dorsum of head. (Greatly enlarged.)
- Fig. 7.—*Circotettix rabula rabula* Rehn and Hebard. Billings, Montana. Male. Tegmen and wing. ($\times 1\frac{1}{2}$)
- Fig. 8.—*Circotettix rabula rabula* Rehn and Hebard. Billings, Montana. Male. Dorsal view of head and pronotum. ($\times 4$)
- Fig. 9.—*Circotettix rabula rabula* Rehn and Hebard. Billings, Montana. Male. Lateral view of head and pronotum. ($\times 4$)

PLATE XII

- Fig. 10.—*Circotettix rabula nigrafasciatus* Beamer. Chalk cliffs near Collyer, Kansas. Male. Tegmen and wing. ($\times 3$)
- Fig. 11.—*Circotettix rabula nigrafasciatus* Beamer. Chalk cliffs near Collyer, Kansas. Male. Dorsal view of head and pronotum. ($\times 3\frac{1}{2}$)
- Fig. 12.—*Circotettix rabula nigrafasciatus* Beamer. Chalk cliffs near Collyer, Kansas. Male. Lateral view of head and pronotum. ($\times 3\frac{1}{2}$)
- Fig. 13.—*Circotettix rabula altior* new subspecies. Cloudcroft, New Mexico. Male (*type*). Tegmen and wing. ($\times 1\frac{5}{8}$)
- Fig. 14.—*Circotettix rabula altior* new subspecies. Cloudcroft, New Mexico. Male (*type*). Dorsal view of head and pronotum. ($\times 3\frac{1}{2}$)
- Fig. 15.—*Circotettix rabula altior* new subspecies. Cloudcroft, New Mexico. Male (*type*). Lateral view of head and pronotum. ($\times 3\frac{1}{2}$)

- Fig. 16.—*Circotettix crotalum* new species. Lee Canyon, Spring Mountains, Nevada. Male (*type*). Tegmen and wing. ($\times 1\frac{1}{2}$)
- Fig. 17.—*Circotettix crotalum* new species. Lee Canyon, Spring Mountains Nevada. Male (*type*). Face. (Greatly enlarged.)
- Fig. 18.—*Circotettix crotalum* new species. Lee Canyon, Spring Mountains, Nevada. Male (*type*). Dorsal view of head and pronotum ($\times 3\frac{1}{2}$)
- Fig. 19.—*Circotettix coconino* new species. Bill Williams Mountain, Arizona Male (*type*). Tegmen and wing. ($2\frac{1}{2}$)
- Fig. 20.—*Circotettix coconino* new species. Bill Williams Mountain, Arizona Male (*type*). Face. (Greatly enlarged.)
- Fig. 21.—*Circotettix coconino* new species. Bill Williams Mountain, Arizona Male (*type*). Dorsal view of head and pronotum. ($\times 4$)

MEXICAN RECORDS OF BLATTIDAE (ORTHOPTERA)

BY MORGAN HEBARD

For some time we have had in the collections various small series of Mexican Blattidae. In studying the family from north of the Mexican boundary, and from Central and northern South America, we have been obliged to refer constantly to this material and, as rapidly as determined, a considerable proportion has been placed in the arranged collections. A much more complete representation from Venvidio, Sinaloa, Mexico, recently received, is now being studied, and the time seemed fitting to make a final examination of all the Mexican series in the Philadelphia collections, or loaned to us for study.

Though admittedly a small and fragmentary collection, the material here reported has been found to include several undescribed forms, while distributional data, useful in studying North American Blattidae, are made available to the student. Extensive, rich and varied as Mexico is, from the standpoint of the biologist, practically no intensive collecting of this family has been done since the time of Saussure, excepting recently in the State of Sinaloa. In the present paper two hundred and thirty-eight specimens are recorded, representing twenty-four genera and forty-one species, of which two species and one geographic race are described as new. Unless otherwise stated the material is in the Hebard Collection.

ECTOBIINAE

Anaplecta fallax Saussure

1862. *Anaplecta fallax* Saussure, Rev. et. Mag. de Zool., (2), xiv, p. 163. [♀], Guatemala.]

1893. *Anaplecta parvipennis* Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, p. 26. [Tabasco, Mexico.]

San Lucracia, Vera Cruz, VI, 19, 1905, (F. Knab), 1♂, 1♀, [U. S. N. M. and Hebard Cln.]. Atoyac, Vera Cruz, XI, 1887, 1♂.

From study of the material here recorded, and specimens from Guatemala and Nicaragua in the Philadelphia Collections, we

feel confident that the name *parvipennis* is based on a condition of the present species in which the tegmina are somewhat reduced, the wings decidedly so. The specimen from Atoyac, as well as two of three individuals before us from Cacao, Trece Aguas, Alta Vera Paz, Guatemala, show that condition.

Anaplecta saussurei¹ new species (Plate XIII, figure 1.)

This very small species appears to be nearest in relationship to *A. elliptica* Saussure and Zehntner, described from Guatemala. In size it is smaller, being one of the most diminutive species of the genus.

In coloration it agrees with paler individuals of the dark brown species, such as *A. lateralis* Burmeister. It is darker than a specimen of *A. domestica* Saussure and Zehntner before us.

The tegmina show an even greater angulation of the costal margin than figured for *A. decipiens* Saussure and Zehntner², due to the more decided obliquity of that margin distad. The form of the wing and its venation is very similar to that figured for *elliptica*.³

Type.—♂; Vera Cruz, Vera Cruz, Mexico. (Rev. T. Heyde.) [Hebard Collection, Type no. 755.]

Size very small, form elliptical. Head slightly longer than broad, width between antennal sockets two-thirds that between eyes; interocellar area forming, with margins of ocellar areas, a projecting but rounded ridge above each antennal socket; ocellar spots obsolete.⁴ Pronotum transverse, nearly rectangulate-oval, narrowing very slightly more cephalad than caudad. Tegmina reaching slightly beyond cercal apices, rather narrow, costal and sutural margins showing very faint convexity, the former suddenly rather strongly oblique in distal fourth to the bluntly rounded apex; costal veins (seven or eight) with intervening irregular veinlets, the distal portion of this area occupied by an irregular network of veinlets; median and proximal portion of ulnar vein alone developed, these discoidal sectors longitudinal. Wings with appendicular field longer than broad, forked mediastine vein extending beyond median portion of costal margin, (four) costal veins scarcely thickened distad; broad medio-discoidal area with a vein which curves obliquely distad from the discoidal vein to the apex of the median vein, from

¹ In honor of Henri de Saussure. The collections personally made by that distinguished author served him as a basis for the description of a considerable proportion of the known species of Mexican Orthoptera.

² Biol. Cent.-Am., Orth., I, pl. iv, fig. 11.

³ Biol. Cent.-Am., Orth., I, pl. iv, fig. 8.

⁴ Probably due to discoloration.

this, two veins, parallel to the discoidal vein, run obliquely distad to base of appendicular field; branches of axillary vein connected by a transverse vein. Supra-anal plate transverse with caudal margin convex, showing a trace of angulation mesad, surface meso-proximad impressed.⁵ Subgenital plate simple, slightly the more produced dextrad; styles simple, straight, cylindrical, the sinistral stout, about twice as long as wide, the dextral slightly over half as wide and of the same length, distal margin of plate between these very broadly convex. Limbs as characteristic of the genus.⁶

Head cinnamon brown; mouthparts, antennae and palpi Dresden brown. Pronotum cinnamon brown, with lateral portions transparent, faintly tinged with brown. Tegmina translucent cinnamon brown, paling very slightly toward costal margin, but with marginal field colored the same as lateral portions of pronotum. Remaining portions of dorsal surface ochraceous-buff, suffused disto-laterad and distad with chestnut brown. Cerci Dresden brown. Limbs immaculate, pale buckthorn brown. Ventral surface of abdomen ochraceous-buff tinged with tawny, weakly suffused with plout's brown latero-distad.

Length of body, 4.1; length of pronotum, 1.3; width of pronotum, 1.9; length of tegmen, 3.8; width of tegmen, 1.4 mm.

The type is unique.

Anaplecta azteca Saussure

1868. *Anaplecta azteca* Saussure, Rev. et Mag. de Zool., (2), xx, p. 97. [♂, ♀; [Orizaba], Mexico.]

Vera Cruz, Vera Cruz, I, 1892, (L. Bruner), 1♂. Cordoba, Vera Cruz, VI, 15, 1905, (F. Knab), 1♀, [U. S. N. M.]. Orizaba, Vera Cruz, I, 1892, (L. Bruner), 1♂, 2♀. Minatitlan, Vera Cruz, II, 1, 1892, (L. Bruner), 1♀.

PSEUDOMOPINAE

Euthlastoblatta orizabae (Saussure)

1868. *Blatta orizabae* Saussure, Rev. et Mag. de Zool., (2), xx, p. 355. [♂, ♀; [Orizaba, Cordillera Oriental, Mexico].]

Atoyac, Vera Cruz, XI, 1887, 2♂. Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 2♀.

This species represents a third group of the genus *Euthlastoblatta*, the pronotum having a pale medio-longitudinal area, recalling species of the genus *Eudromiella*. The males have no very decided specialization of the subgenital plate, as is found in the *Compsa* Group.

⁵ It is probable that the tuft of agglutinated hairs, occurring there in males of other species of *Anaplecta*, is also developed in this species, but can not be seen in the present specimen.

⁶ Described, Mem. Am. Ent. Soc., no. 4, p. 17, (1920).

***Ceratinoptera nahua* (Saussure)**

1868. *Paraceratinoptera nahua* Saussure, Rev. et Mag. de Zool., (2), xx, p. 357. [♂, ♀; [Cordillera Oriental], Mexico]

The series of this species from Motzorongo, Orizaba and Minatitlan, all in the state of Vera Cruz, has been fully discussed, and the synonymy of Saussure's *Paraceratinoptera* with *Ceratinoptera* Brunner, and Saussure and Zehntner's *Paraceratinoptera dohrniana* with *nahua*, established.⁷

***Ceratinoptera tropaia* Hebard**

1916. *Ceratinoptera tropaia* Hebard, Trans. Am. Ent. Soc., xlii, p. 133, fig. 4. [♂; Motzorongo, Vera Cruz, Mexico.]

The type of this strongly brachypterous species is unique.

***Latiblattella vitrea* (Brunner)**

1865. *Phyllodromia vitrea* Brunner, Nouv. Syst. Blatt., p. 109, pl. II, figs. 8 A to E. [♂; Vera Cruz, [Mexico].⁸]

Mexico, IV, 2♂, [M. C. Z.]. Cordoba, Vera Cruz, V, 10, 1908, (F. Knab, in flower sheath of *Arum*), 1♀, [U. S. N. M.]; VI, 13, (F. Knab), 1♀, [Hebard Coll.]. San Rafael, Vera Cruz, (C. H. T. Townsend), 1♂.

Compared with the series of *L. lucifrons* Hebard before us, we find the present insect to differ in being less broad, with pronotum less ample and considerably narrower, and cross-veinlets of anterior field of wings heavier and darker and, as a result, much more conspicuous.

In *vitrea* the male subgenital plate has the meso-distal portion with margins weakly convex convergent to the truncate apex, each of these margins forming a raised and rounded lateral ridge. Along the dorsal margins of these the styles are produced mesad as elongate, tapering, slender plates, each terminating above the apex of the median portion in a rounded knob, microscopically and very minutely spined, each produced dorso-laterad in internal section as a small rounded lamella. The tarsal claws are decidedly asymmetrical, the shorter projecting slightly beyond the arolium, and in length two-thirds that of the longer.

⁷ Hebard, Trans. Am. Ent. Soc., xlii, p. 131, (1916).

⁸ We here select Vera Cruz, Mexico, as the type locality. The material originally included from the Fiji Islands, almost certainly represents a different genus and species, or was incorrectly labelled.

The Costa Rican *L. pavidus* (Rehn) agrees closely in size and form with this species; the distal cross-veinlets of the wings are, however, inconspicuous and the male genitalia very different.

Measurements (in millimeters)

	♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Mexico		11.6	3.2	5	12.7	4
Mexico		13.7 ⁹	3.3	4.8	12.8	4
San Rafael, Vera Cruz		11.3	3.2	4.7	11.9	3.8
	♀					
Cordoba, Vera Cruz		12	3.7	5.1	10.7	4.1
Cordoba, Vera Cruz	3.7	5.3	10.3	4

***Latiblattella lucifrons* Hebard**

1917. *Latiblattella lucifrons* Hebard, Mem. Am. Ent. Soc., no. 2, p. 43, pl. 1, figs. 18 to 23. [♂, ♀; Santa Rita Mountains, Arizona.¹⁰]

San José del Cabo, Lower California, 1 ♀. Huejotitlan, Jalisco, 1700 meters, VI and VII, 1 ♂.

This species will be fully discussed in our forthcoming paper on the Sinaloa collection, from which state we have a large number of specimens.

***Latiblattella picturata* new species (Plate XIII, figures 2 to 8.)**

Apparently closely related to *L. zapoteca* (Saussure), the present insect differs in the smaller size and very strongly asymmetrical tarsal claws.¹¹ The single female before us further shows much greater reduction in the organs of flight, these not reaching the base of the subgenital plate.

In specimens of intensive coloration, the picturing of the pronotal disk is strikingly beautiful.

Type.—♂; San José del Cabo, Lower California, Mexico. [Hebard Collection, Type no. 757.]

Size medium small, form moderately slender for this genus of comparatively broad species. Head with interocular space slightly over half (in paratype slightly less than half) that between antennal sockets; inter-ocular-ocellar area flattened, showing a feeble concavity; ocellar areas well defined ocellar spots moderately large and distinct. Maxillary palpi with distal

⁹ Abdomen distended.

¹⁰ Material also recorded from the Huachuca and Baboquivari Mountains, Arizona.

¹¹ Two Costa Rican females, apparently representing *zapoteca*, though somewhat smaller than the type, have the tarsal claws very weakly asymmetrical, much as in *L. lucifrons* Hebard.

joint large and elongate, nearly as long as (or in paratype as long as) fourth joint; fourth joint elongate, slightly shorter than third. Pronotum as characteristic of genus, greatest width meso-caudad, surface weakly convex and showing weak lateral deflection. Tegmina and wings fully developed, venation as characteristic of genus, costal veins slightly heavier distad. Abdomen with sixth tergite having a deep semicircular depression mesad, bearing a scant fringe of hairs on its cephalic face, caudad of which the segment is raised in a large blunt knob, with surface cephalo-dorsad covered with a heavy tuft of somewhat agglutinated, short hairs, these parting from the medio-longitudinal line and directed cephalo-laterad, caudal portion of tergite subchitinous mesad. First to sixth tergites with latero-caudal angles weakly produced, forming a rounded angle of slightly less than ninety degrees, this larger for sixth tergite; succeeding tergites decidedly constricted, more so than in *lucifrons*. Supra-anal plate transverse, very weakly triangularly produced, with apex weakly bilobate. Subgenital plate of type characteristic of genus; disto-mesal section produced, directed upward, rounded and bluntly angulate sinistro-distad; the lateral sections are similarly directed upward with hinged styles lying along the margins of the median production, the dextral much heavier than the sinistral, the bluntly rounded apices of these attinent and curling caudad; within, from the base of the sinistral style, a more strongly chitinous, cylindrical process is directed dorsad, its blunt apex flattened out caudad on a plane with the dorsal margin of the sinistral style. Limbs as characteristic of the genus. Tarsal claws very strongly asymmetrical, the shorter not extending as far as the large pulvillus.¹²

Allotype.—♀; San Jorge, Lower California, Mexico. [Hebard Collection.]

Agrees with type in color pattern, asymmetry of tarsal claws and other features, excepting the following. Size smaller. Interocular space much wider, four-fifths that between the antennal sockets, ocellar areas less distinct and ocellar spots smaller. Pronotum with point of greatest width nearer the more truncate caudal margin.¹³ Tegmina and wings greatly reduced, but extending to near base of supra-anal plate. Tegmina narrow, elongate oval.¹⁴ Dorsal surface of abdomen neither specialized or con-

¹² The degree of asymmetry of the tarsal claws appears to be one of the most useful characters in distinguishing the species of this genus. It is evident that *Latiblattella* includes a number of species, all of very similar type even in such characters as the specialization of the male tergites and subgenital plate. None of these species have revealed distinctive characters not shared by the others and differences of degree, such as of form, of tegmina and wing development and of amount of asymmetry shown by the tarsal claws, are thus of great importance. The male concealed genitalia will, very possibly, show individual diagnostic characters, but there is not sufficient material of many of the species available to determine this.

¹³ We have found that this change in pronotal form is almost always a direct response to great reduction in the organs of flight.

¹⁴ Much as figured for "*Temnopteryx kaupiana*" Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, pl. iv, fig. 24, (1893).

stricted distad. Supra-anal plate triangularly produced, lateral margins convergent and broadly concave, then broadly convex to the subtruncate apex. Subgenital plate large, scoop-shaped, extending a little beyond apex of supra-anal plate, lateral portions produced and raised, with margin convex to point opposite cerci, there broadly obtuse-angulate rounded emarginate, with remaining portion of free margin broadly convex to a very briefly longitudinal, meso-distal cleft.

Coloration of type. Head with a pair of vague brown suffusions between the eyes and ocelli, between the antennal sockets and above the clypeus, these fusing with each other and with a brown suffusion mesad on the clypeus, leaving a conspicuous buffy wedge-shaped area mesad on the face; vertex, ocelli and areas between the brown suffusions buffy. Palpi, limbs and underparts ochraceous-buff tinged with tawny, the abdomen with a heavy submarginal band of deep prout's brown on each side. Pronotal disk ochraceous-buff tinged with tawny, delicately pictured with blackish prout's brown, lateral portions and tegmina weakly transparent, faintly tinted with buckthorn brown. Wings transparent, similarly tinted in area of costal veins, elsewhere more faintly so. Dorsal surface of abdomen suffused with prout's brown, margined with ochraceous-buff.

Allotype very similarly, but much more intensively, colored, not tinged with tawny. Head markings heavier and chestnut brown, base of first antennal joint and palpi to near tips of last joint of this color. Cephalic femora chestnut brown, paling to buffy dorso-distad; other femora buffy, margined with chestnut brown. Tibiae buffy, heavily flecked with chestnut brown at bases of spines. Tarsal joints buffy, first three suffused with chestnut brown distad. Pronotum similarly but more heavily pictured with chestnut brown. Abdomen, above and below, solidly chestnut brown, margined with buffy.

A paratype male, from the State of Sinaloa, shows a most striking intensive coloration of head and pronotal disk, the suffusions becoming more solid and sharply defined, the vertex streaked vertically with brown, and the picturing of the pronotal disk heavier and more conspicuous.

The other paratype male, from Lower California, shows a very slightly greater recession of the color pattern than does the type.

Of the juveniles, that from Lower California shows the maximum of recessive coloration in the series, with pronotal picturing almost obsolete and cephalic markings reduced to vague dots. The juvenile from Sinaloa is nearly as intensively colored as the adult from that state. In consequence these juveniles have a very different superficial appearance.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
San José del Cabo, Lower California, <i>type</i>	12 ¹⁵	3	4.2	13.8	3.9
Sierra el Tosti, Lower California, <i>paratype</i>	3	4.2	11.3	3.6
Venvidio, Sinaloa, <i>paratype</i>	13 ¹⁵	3	4.4	12.1	4

¹⁵ Abdomen extruded.

	?	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
San Jorge, Lower California, <i>allotype</i> . . .		9.8 ¹⁶	3	4.3	6	2.7

Specimens Examined: 6, 3 males, 1 female and 2 immature individuals

San José del Cabo, Lower California, 1 ♂, *type*, 1 juv. ♂.

Sierra el Tosti, Lower California, 1 ♂, *paratype*.

San Jorge, Lower California, 1 ♀, *allotype*.

Venvidio, Sinaloa, VI, 16, 1918, (J. A. Kusehe), 1 ♂, *paratype*, 1 juv. ♂.

***Latiblattella tarasca* (Saussure)**

1862. *Blatta tarasca* Saussure, Rev. et Mag. de Zool., (2), XIV, p. 164. [♀, Mexico]

San Luis Potosi, San Luis Potosi, (E. Palmer), 2 ♀, [M. C. Z. and Hebard Coll.].

These specimens agree closely with the more satisfactory description subsequently given by Saussure.¹⁷

In spite of the decided tegminal reduction and vestigial wings, the insect, known only from the female sex, is clearly a member of the genus *Latiblattella*, agreeing in all characters of form, type of female subgenital plate, limb armament, pulvilli, arolia and tarsal claws. In this insect the tarsal claws are very strongly asymmetrical, the shorter not extending quite as far as the apical margin of the very large arolium. The species has been referred to the composite genus *Temnopteryx*.

In the present specimens, dried after immersion in alcohol, the only noteworthy color difference from the type is the paler abdomen; rich shining hazel above and below, broadly and sharply bordered with warm buff.

The measurements are: length of body, 9.8–11; length of pronotum, 3.2–3.3; width of pronotum, 4.6¹⁸–4.6; length of tegmen, 4.7–5; width of tegmen, 2.8–2.9 mm.

It is very possible that *Temnopteryx kaupiana*, described by Saussure from Moyoapan, Cordillera Oriental, Mexico, will be found to constitute a synonym of the present species.

¹⁶ Abdomen retracted.

¹⁷ Mém. l'Hist. Nat. Mex., Blatt., p. 95, (1864).

¹⁸ If in normal position. The pronotum is somewhat buckled in this specimen.

An added difficulty is here found in studying the genus *Lattiblattella*, as the tegmina in females of certain species are seen to have reached a degree of reduction sufficient to have resulted in their being assigned to the composite genus *Temnopteryx*, as understood in the early literature.

***Neoblattella fratercula* Hebard**

1916. *Neoblattella fratercula* Hebard, Ent. News, xxvii, p. 159, figs. 1 and 2. [♂, ♀; Isla de Cocos, Costa Rica]

San Rafael, Vera Cruz, (C. H. T. Townsend), 1 ♀.¹⁹ Cordoba, Vera Cruz, IV, 28, 1908, (F. Knab; in bromeliads), 1 ♀, 1 ♂, [U. S. N. M.].

These specimens, like Panamanian material recorded by us, are appreciably larger than those of the type series. An unrecorded Guatemalan series shows an average in size intermediate between these.

***Blattella germanica* (Linnaeus)**

1867. [*Blatta*] *germanica* Linnaeus, Syst. Nat., Ed. xii, i, p. 668. [Denmark.]

Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 1 ♂. Puebla, Puebla, 6 ♀, 1 juv. ♀, [Paris Museum]. San José del Cabo, Lower California, 1 ♂, 1 ♀.

***Parcoblatta americana* (Scudder)**

1900. *Loboptera americana* Scudder, Proc. Davenport Acad. Sci., viii, p. 93, pl. 2, fig. 4. [1 ♀; Ehrenberg, Arizona.]

Lower California, (G. W. Dunn), 1 ♂.

***Ischnoptera tolteca* Saussure**

1868. *Ischnoptera tolteca* Saussure, Rev. et Mag. de Zool., (2), xx, p. 336. [♂, ♀; Mexico.]

San Lucracia, Vera Cruz, VI, 19 and 20, 1905, (F. Knab), 1 ♂, 1 ♀, [U. S. N. M.].

These specimens have the pronotal disk to near the caudal margin dark brown, the dark color beneath showing through the caudal portion; the cephalic margin is narrowly, the lateral margins more broadly, buffy, this forming a conspicuous angulate invasion on each side before the humeral shoulders.

¹⁹ Incorrectly recorded by Hebard as *N. brunneriana* (Saussure), Ent. News, xxvii, p. 159, footnote 1, (1916). See also Mem. Am. Ent. Soc., no. 4, p. 61, footnote 88, (1920).

The supra-anal plate in the male is subchitinous meso-distad, the distal margin being broadly rounded and irregularly serrate, the lateral margins with a ventral fringe of minute stout spines, the ventral surface of the subchitinous area with fewer and more irregular, heavier spines directed caudad; in the female this plate is triangularly produced, with margins weakly convex-convergent to the weakly and shallowly bilobate apex. The male shows a heavy spine springing from the base of the sinistral cercus, directed mesad, and below this an elongate plate, extending beyond the median portion of the anal chamber, with dorso-distal portion produced in a rounded projection; dextrad little specialization appears to occur. In the male the heavy styles are separated by a lesser distance than the width of one of these, the dextral style is somewhat the heavier and blunter, twice as long as its greatest width; both styles are well supplied with minute but stout spines on their dorsal surfaces.

Length of body, ♂ 12.5, ♀ 11.5; length of pronotum, ♂ 2.8, ♀ 3; width of pronotum, ♂ 3.7, ♀ 4; length of tegmen, ♂ 11.9, ♀ 12; width of tegmen, ♂ 3.4, ♀ 3.5 mm.

***Ischnoptera azteca* (Saussure)**

1862. [*Ischnoptera*] *azteca* Saussure, Rev. et Mag. de Zool., (2), xiv, p. 170. [[♂, Gulf coast of] Mexico.]

Motzorongo, Vera Cruz, (L. Bruner), 1 ♀.

This specimen shows an extremely recessive coloration, the head is dark, but the pronotum is ochraceous-buff faintly tinged with ochraceous-tawny, the pair of dark suffusions reduced so that they occupy only the latero-caudal sulci of the disk. These markings are dark chestnut brown. In all other respects it agrees closely with Saussure's diagnosis. That author has stated the species is subject to decided color variation.

Length of body, 14.7; length of pronotum, 3.4; width of pronotum, 4.4; length of tegmen, 14.8; width of tegmen, 4 mm.

***Symploce hospes* (Perkins)**

1899. *Phyllodromia hospes* Perkins, Fauna Hawaiiensis, II, p. 5. [♂; Kauai [Island] and Honolulu, [Oahu Island, Hawaiian Islands].]

1916. *Symploce lita* Hebard, Trans. Am. Ent. Soc., XLII, p. 357, pl. XVII, fig. 8, pl. XVIII, figs. 1 to 4. [♂, ♀: Key West, Florida; Vera Cruz, Vera Cruz and San José del Cabo, Lower California, Mexico.]

Vera Cruz, Vera Cruz, 1 ♂. San José del Cabo, Lower California, 2 ♀, 3 ♂.

Opportunity to examine Hawaiian material has proven beyond question the synonymy indicated above. The description of *hospes* is insufficient to make determination possible from it alone, and the there appended statement by Brunner, that the species is allied to *Phyllodromia conspersa* Brunner, misled us completely. *Conspersa* is a South American member of the genus *Neoblattella*, referable to the Group Blattellae, while *Symploce* is a member of the Group Ischnopterae showing an Epilamprine tendency.

***Euphyllodromia angustata* (Latreille)**

1811. *Blatta angustata* Latreille, in Humboldt and Bonpland, Recueil Observat. Zool. et Anat. comp., 1, p. 146, pl. xv, fig. 9. [Vera Cruz, [Vera Cruz, Mexico]]

San Rafael, Vera Cruz, (C. H. T. Townsend), 1 ♀. Cordoba, Vera Cruz, IX, 9, 1905, (F. Knab), 1 ♀.

***Pseudomops septentrionalis* Hebard**

1917. *Pseudomops septentrionalis* Hebard, Mem. Am. Ent. Soc., no. 2, p. 156, pl. vi, figs. 5 to 8. [♂, ♀; Brownsville, Texas.²⁰]

At the time this species was described, two Mexican females were also discussed, one from Saltillo, Coahuila, the other from San José, Tamaulipas. A large series is now before us from Venvidio, Sinaloa, which we will consider more fully in our study of the Orthoptera of that state.

***Pseudomops oblongata* (Linnaeus)**

1758. *Blattella oblongata* Linnaeus, Syst. Nat., Ed. x, 1, p. 425. [America.]

At the time *P. septentrionalis* Hebard was described, the material of this species from the collections now studied was recorded and compared; a series of both sexes from the Distrito Federal, Teapa in Tabasco and San Rafael, Orizaba, Cordoba and Vera Cruz in Vera Cruz.

Material from Cuernavaca, Morelos and Tuxpan, Jalisco, previously recorded by Rehn, is in the Academy Collection.

²⁰ In addition, fourteen other Texan localities are given and the Mexican localities noted below.

NYCTIBORINAE

Nyctibora azteca Saussure and Zehntner

1893. *Nyctibora azteca* Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, p. 56, pl. iv, fig. 34. [♂; Capetillo, Guatemala.]

Tehuacan, Puebla, 1 ♀, 2 juv., [Paris Museum].

There is also in the Philadelphia Collections an adult female of this species labelled "Mat." We know that this specimen came from some Mexican museum and believe that the label signifies Matamoros, Puebla. The measurements of this specimen are; length of body, 26.7; length of pronotum, 6.7; width of pronotum, 9.7; length of tegmen, 21; width of tegmen, 8.3 mm.

Paratropes mexicana Brunner

1865. *Paratropa mexicana* Brunner, Nouv. Syst. Blatt., p. 151, pl. iv, figs. 15A to E. [♀; Oaxaca, Mexico.]

Vera Cruz, (Rev. T. Heyde), 1 ♀.

This specimen, probably taken in the southern portion of the State of Vera Cruz, measures as follows: length of body, 21.3; length of pronotum, 6.8; width of pronotum, 10.7; length of tegmen, 24.8; width of tegmen, 10 mm.

EPILAMPRINAE

Epilampra maya brachyptera new subspecies (Plate XIII, figures 9 and 10.)

The typical race of this species is represented in the Philadelphia Collections by material from Nicaragua, Costa Rica, Panama and the Island of Trinidad.

The present race, from the southern portion of the Mexican State of Vera Cruz, is readily distinguished by the considerable reduction in the organs of flight. This appears to be a constant feature in that region.

Type.—♂; Minatitlan, Vera Cruz, Mexico. February 1, 1892. (L. Bruner.) [Hebard Collection, Type no. 761.]

Agrees in all respects with males of *Epilampra maya maya* Rehn, except in the reduction of the organs of flight and wider interocular space. Interocular space wider than that between the large ocelli, three-quarters as wide as space between antennal sockets.²¹ Tegmina extending only to apex of abdomen; wings reduced, probably incapable of sustained flight, but when closed reaching as far caudad as the tegmina.

²¹ In males of typical *maya* the interocular space is narrower, scarcely two-thirds as wide as that between the antennal sockets.

Allotype.—♀; Same data as type. [Hebard Collection.]

Similar to females of typical *maya* except in the reduction of the organs of flight. Interocular space scarcely wider than in male, much as in females of typical *maya*.²² Tegmina covering about half the dorsal abdominal surface; wings reduced, incapable of sustained flight, when closed reaching as far caudad as the tegmina.

It is of interest to note that, in the present race, the reduction in the organs of flight has had no effect whatever on the form of the pronotum.

In coloration no difference from *maya maya* is shown.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
<i>Type</i>	16.5	5.3	7.1	13.7	5.3
<i>Paratypes</i> (5).....	17.2-19	5-5.6	6-7.1	12.3-13.2	5-5.7
♀					
<i>Allotype</i>	24.8	6.7	8	14.3	6.3
<i>Paratypes</i> (15).....	20-26	6-6.8	7.4-8.7	12.8-14.4	5.8-6.8

The following characters, not given in the original description of *maya*, are noted for both races of the species.²³ Male. Maxillary palpi with second joint twice as long as wide, third joint four-fifths as long as the narrowly enlarged fifth joint, fourth joint almost as long as third, expanding distad. Abdominal tergites with latero-caudal angles bluntly rounded. Supra-anal plate bilobate and weakly chitinous distad. Subgenital plate of the unspecialized, asymmetrical lobiform type characteristic of the genus, with styles simple, straight, elongate. Ventro-cephalic margin of cephalic femora armed with a row of heavy proximal spines, succeeded by well spaced, minute, chaetiform spines, terminated by two heavy elongate spines, of which the more distal is twice as long as the more proximal; other ventral femoral margins supplied with heavy elongate spines, of which those of the caudal margins are distinctly the longer. Four proximal tarsal joints with large distal pulvilli, three proximal joints biserially armed with spinulae ventrad. Medium sized arolia present between the simple, symmetrical tarsal claws.

Female. Similar, but larger and broader. Ocelli smaller and less conspicuous. Dorsal abdominal tergites with latero-caudal angles produced

²² Thus, in typical *maya*, there is a decidedly greater contrast between the sexes in width of interocular space, than in the present race. Too great stress should not be given this fact, as it is very possible that, in coordination with reduction in the organs of flight, the male of *m. brachyptera*, as well as the female, has retained the type showing closer agreement with that of the immature condition. In typical *maya*, with fully developed organs of flight, such is also the case for the female sex, but a change has occurred in the male. We have found generally that immature characteristics remain unchanged longer in females than in males of the Blattellidae.

²³ Many of these are probably of generic, rather than specific, significance.

caudad in minute but sharp, spiniform teeth. Supra-anal plate more chitinous distad, more produced, with lateral margins more convergent, similarly bilobate distad. Subgenital plate large, simple, convex, free margin broadly concave opposite cerci and broadly convex distad.

The general coloration of this species varies in the series from tawny olive to sayal brown, the darker punctae of the pronotum being so small they are scarcely appreciable to the naked eye. The tegminal flecks are often conspicuous, though few in number; rarely these are greatly reduced in size.

Specimens Examined: 28; 6 males, 15 females and 7 immature individuals.

Orizaba, Vera Cruz, I, 1892. (L. Bruner), 1 large juv. ♀.

San Rafael, Vera Cruz, (C. H. T. Townsend), 1 large juv. ♀.

Minatitlan, Vera Cruz, I, 31 to II, 2, 1892, (L. Bruner), 6 ♂, 15 ♀, *type, allotype, paratypes*, 1 large juv. ♀, 4 juv. ♂.

***Epilampra mexicana* Saussure**

1862. *[Epilampra] mexicana* Saussure, Rev. et Mag. de Zool., (2), xiv, p. 228. [[♂], Mexico.]

Aspinwall Barrio, Isthmus of Tehuantepec, (F. Sumichrast), 1 ♀.

From the description the type is seen to be more intensively colored than the present specimen.

BLATTINAE

***Periplaneta americana* (Linnaeus)**

1758. *[Blatta] americana* Linnaeus, Syst. Nat., Ed. x, p. 424. [America.]

Guadalajara, Jalisco, (D. L. Crawford), 9 ♀, 1 ♂, [A. N. S. P.].

We have placed *P. americana colorata* Rehn, described from Cuernavaca, Morelos, in the synonymy of this species.²⁴

***Periplaneta brunnea* Burmeister**

1838. *[Periplaneta] brunnea* Burmeister, Handb. Ent., II, abth. II, pt. I, p. 503. [♂, ♀: Chile; Demerara (= British Guiana).]

Guadalajara, Jalisco, (D. L. Crawford), 1 ♀, [A. N. S. P.].

***Periplaneta australasiae* (Fabricius)**

1775. *[Blatta] australasiae* Fabricius, Syst. Ent., p. 271. ["In nave e mare pacifico et regionibus incognitis revertente".]

Orizaba, Vera Cruz, IX, 8, 1906, (P. P. Calvert), 1 juv. ♂, [A. N. S. P.]. Minatitlan, Vera Cruz, II, 1, 1892, (L. Bruner), 1 small juv.

²⁴ Mem. Am. Ent. Soc., no. 2, p. 178, (1917).

PANCHILORINÆ

***Pycnoscelus surinamensis* (Linnaeus)**

1767. [*Blatta*] *surinamensis* Linnaeus, Syst. Nat., Ed. x, p. 687. [Surinam.]

Vera Cruz, Vera Cruz, (Rev. T. Heyde), 5 ♀, 2 juv. ♀. Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 1 juv. ♀. San Rafael, Vera Cruz, (C. H. T. Townsend), 5 ♀. Orizaba, Vera Cruz, I, 1892, 7 ♀, 15 juv. ♀. Minatitlan, Vera Cruz, II, 1, 1892, (L. Bruner), 1 ♀, 2 juv. ♀. Guadalajara, Jalisco, (D. L. Crawford), 1 ♀, [A. N. S. P.]; 1 ♀ 2 juv. ♀, [Paris Museum]. La Paz, Lower California, 1 ♀, [Paris Museum]. San José del Cabo, Lower California, 23 ♀, 11 juv. ♀.

***Panchlora cubensis* Saussure**

1862. [*Panchlora*] *cubensis* Saussure, Rev. et Mag. de Zool., (2), xiv, p. 230. [♀, Cuba.]

Vera Cruz, (Rev. T. Heyde), 3 ♀. San Rafael, Vera Cruz, (C. H. T. Townsend), 2 ♂, 3 ♀. Omcalca, Vera Cruz, IV, 16, 1908, (F. Knab), 2 ♂. Orizaba, Vera Cruz, I, 1892, (L. Bruner), 2 ♂, 1 ♀, 1 juv. ♂, 10 juv. ♀. Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 1 ♂, 3 juv. ♂, 5 juv. ♀. Minatitlan, Vera Cruz, II, 2, 1892, (L. Bruner), 1 juv. ♀.

The dark brown and largely glabrous immature individuals of this species, with wide interocular space and close resemblance to the immature condition of *Pycnoscelus surinamensis* (Linnaeus), differ very strikingly from the pale green adults, which show a number of decided structural differences as well. It was due to this great dissimilarity and the size of the larger juveniles, which led us to describe the immature material, recorded above, as representing a new genus and species, *Pycnosceloides aporus*. Breeding experiments in Colombia, made during the summer of 1920, revealed to us our most regrettable mistake, and we have recently placed our name in synonymy. The immature condition of any species of *Panchlora* had not previously been recognized.

***Panchlora acolhua* Saussure and Zehntner**

1893. *Panchlora acolhua* Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, p. 95. [♀; Guerrero, Mexico.]

Tonala, Chiapas, 1 ♀, [A. M. N. H.].

Material from Guatemala and Panama, recorded as representing two varieties of this species, has been discussed by us.²⁵

This is a relatively large and very broad species, pale green in general coloration, with antennae annulate and tegmina without black lines or dots. In the present specimen the dark antennal annulus occupies three and three and one-half joints, the interocular width being appreciably greater than the occipital ocular depth, the interocular space embrowned. The supra-anal plate is not strongly bilobate. The free margin of the subgenital plate is weakly sinuous, showing no markedly concave sections laterad or distad. Length of body, 22.7; width of interocular space, .8; length of pronotum, 7.4; width of pronotum, 9.7; length of tegmen, 23.7; width of tegmen, 8.9; width of tegminal marginal field, 2.3 mm.

***Panchlora mexicana* Saussure** (Plate XIII, figure 11.)

1862. *P[anchlora] mexicana* Saussure, Rev. et Mag. de Zool., (2), xiv, p. 231. [[♀; Valleys of eastern slope of Cordillera Oriental], temperate Mexico.]

San Rafael, Vera Cruz, (C. H. T. Townsend), 1♂.

From the unstudied series before us it is evident that considerably more species of this general type exist than has been supposed. We do not believe that Saussure's *mexicana* is the same as Burmeister's *pulchella* from Brazil, or Stoll's *quadripunctata* from Brazil. This synonymy was indicated by Brunner, who had only Brazilian material before him, and concurred in by Saussure and Zehntner, who recorded Mexican material only. Lack of South American material referable to *quadripunctata* prevents a satisfactory comparison at the present time.

The specimen before us resembles three males of *P. zendala* Saussure,²⁶ to which species it is closely related; differing in the decidedly smaller size, interocular space dark only in portion toward occiput (in *zendala* wholly dark), more numerous tegminal black dots, particularly caudad of the anal sulcus, and absence of a delicate longitudinal black line meso-distad on the discoidal vein of the tegmina.

These specimens agree in the rich but pale ochraceous-buff general coloration, sub-attinent eyes, antennae with a dark an-

²⁵ Mem. Am. Ent. Soc., no. 4, p. 108, (1920).

²⁶ From Cayuga, Guatemala, taken by W. Schaus in May, 1915, in the National Museum and Hebard Collection. Length of body, 18.2 to 19.3; length of pronotum, 5.8 to 5.9; width of pronotum, 6.8 to 6.9; length of tegmen, 19.8 to 20.9; width of tegmen, 6.9 to 7 mm.

nulus (occupying five joints) near their extremities.²⁷ pronotum with a fine black line bordering the opaque portion on each side, tegmina with a similar line on the inner margin of the anal sulcus in its longitudinal portion, inner half of marginal field to beyond discoidal vein opaque and pale ochraceous-buff, with a black fleck opposite the extremity of the black line²⁸ and a similar meso-distal black one in the discoidal field,²⁹ cerci short and tapering to their short but slender apices, subgenital plate asymmetrical, with sinistral portion roundly produced and very elongate styles, which in length average over half that of the cerci.

The measurements of the male before us are given first, those for the male recorded by Saussure and Zehntner, from the State of Vera Cruz, Mexico, as *pulchella*, are given second; length of body, 14.5 "15"; length of pronotum, 4.9 "5.5"; width of pronotum, 5.8 "6.2"; length of tegmen, 16.2 "17"; width of tegmen, 5.8 mm.

Panchlora montezuma Saussure and Zehntner

1893. *Panchlora montezuma* Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, p. 98. [♂, ♀: Presidio of Mazatlan, [Sinaloa], Mexico.]

San José del Cabo, Lower California, 2♂, 2♀.

Panchlora azteca Saussure

1892. *P[anchlora] azteca* Saussure, Rev. et Mag. de Zool., xiv, p. 230. [♀: [Córdoba, Vera Cruz], tropical Mexico.]

Distrito Federal, (J. R. Inda), 1♀.

This specimen agrees with Saussure's description of a unique female, except in being of smaller size, with pronotum showing a large suffusion of prout's brown on each side, paralleling the caudal margin above the shoulders.³⁰ The antennae were ap-

²⁷ In all data on the Brazilian material referable to this type of the genus, no mention is made of antennal annuli, but we can not be certain that such do not exist in some, for Brunner's discussion alone mentions the antennal coloration, that author giving for Brazilian material, which he assigned to *pulchella* of Burmeister, "antennis fuscis."

²⁸ This fleck absent on both tegmina in one of the specimens of *zendala*.

²⁹ These flecks are heavier in the specimens of *zendala*, and in one there is a black fleck proximad in this field on the dextral tegmen only. From the type of that species additional flecks are described, and it is evident there is some individual variation in the number of these.

³⁰ The differences shown may indicate specific distinction, but additional material must be secured before their significance can be determined.

parently missing in the type; in the present specimen they are ochraceous-tawny with a black annulus in distal portion, including eight joints. Length of body, 18.3; length of pronotum, 5.9; width of pronotum, 7.2; length of tegmen, 21; width of tegmen, 7.1 mm.

BLABERINÆ

Blaberus trapezoideus Burmeister

1838. *Bl[abera] trapezoidca* Burmeister, Handb. Ent., II, abth. II, pt. I, p. 516. [Mexico.]

1838. *Bl[abera] limbata* Burmeister, *ibid.*, p. 516. [Mexico.]

1868. *Blabera quadrifera* Walker, Cat. Blatt. Br. Mus., p. 3. [♂, Oaxaca and Vera Cruz, Mexico.]

Vera Cruz, (Rev. T. Heyde), 1 ♂. Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 1 juv. ♂, 1 juv. ♀.

We refer to *trapezoideus* the present material, as well as a female from "Central America" collected by the Rev. T. Heyde, and a pair from Guatemala City, Guatemala. This is a species related to *B. discoidalis* Serville, but averaging larger, more attenuate, showing a usually more distinct tinge of tawny, with tegmina more elongate and having their apices more sharply rounded, particularly in the male sex. The dark marking of the humeral trunk often spreads over the proximal portion of the discoidal field, but in recessive examples that suffusion is decidedly reduced and separated from the marking of the humeral trunk by a pale interval.

It would appear probable, from Burmeister's very brief description, either that his *trapezoidea* was based on the male, *limbata* on the female sex of this species, or that individuals of different coloration were represented. Walker's *quadrifera* is clearly the same species, and already has been placed as a synonym under *trapezoideus* by Kirby. Saussure and Zehntner have stated that the pronotal coloration is subject to great individual variation,³¹ but their placing of *B. mexicana* (Saussure)³² in the synonymy may indicate that other species were represented in the Mexican series treated, while the West Indian and

³¹ Biol. Cent.-Am., Orth., I, p. 118, pl. v, figs. 26 to 31, (1894).

³² That name we have assigned to synonymy under *B. colosseus* (Illiger), which we have more recently determined to be a synonym of *B. giganteus* (Linnaeus). The maximum measurements given by Saussure and Zehntner indicate that, in the series measured, specimens of *giganteus* were included.

South American records almost certainly apply to other forms. We now have strong evidence to show that *trapezoideus* is not found either in the West Indies or southward as far as Panama.

The species represented by the material here treated has been frequently referred to Stoll's *Blatta ferruginea*, 1813, based on a description and a figure which are unrecognizable, except that they represent a species of the genus *Blaberus*. As no locality is given and material is not known to be in existence, we feel fully warranted in eliminating that name from consideration as unrecognizable.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
♂					
Vera Cruz, Mexico	45 5	12 7	17	49 8	17 8
Guatemala City, Guatemala	45	13 2	18	49.3	17 6
♀					
Central America	45	13 7	18 7	53 9	20
Guatemala City, Guatemala	49	14	19 9	52 7	19.3

***Blaberus cranifer* Burmeister**

1838. *Bl[abera] craniifera* Burmeister, Handb. Ent., II, abth. II, pt. 1, p. 516. [Cuba.]

Mexican material from Tekanto, Tunkas, Progreso and Merida, all in the State of Yucatan, as well as a specimen from Benque Viejo, British Honduras, was recorded by us at the time the differences between this striking species and the South American *B. atropos* (Stoll) were pointed out.³³ In past literature the species, known also from Cuba and Key West, Florida, has been frequently recorded in error as *atropos*.

CORYDIINAE

***Melestora micra* Hebard**

1920. *Melestora micra* Hebard, Mem. Am. Ent. Soc., no. 4, p. 121, pl. VI, fig. 5. [♂; Paraiso, Canal Zone, Panama.]

Victoria, Tamaulipas, X, 12, (E. A. Schwarz), 1 ♂, [U. S. N. M.].

³³ Mem. Am. Ent. Soc., no. 2, p. 204, (1920)

As in the paratype of this minute species, the present specimen has the remarkably specialized section of the median portion of the subgenital plate tucked inward, so as to be only in small part visible from the outside.

This specimen is paler than the Panamanian material, with head and pronotum cinnamon-brown, and other portions ochraceous-buff tinged with tawny. Additional material may show it to represent a distinct species, but that, in our opinion, is improbable.

Compsodes schwarzi (Caudell)

1903. *Latindia schwarzi* Caudell, Proc. Ent. Soc. Wash., v, p. 165. [♂; Madera Canyon, Santa Rita Mountains, Arizona.]

We have recorded material of this species from Sierra el Tosti and San José del Cabo, Lower California.³⁴

Compsodes mexicanus (Saussure)

1868. *Latindia mexicana* Saussure, Rev. et Mag. de Zool., (2), xx, p. 100.

At the time the synonymy of *L. tolteca* Saussure and Zehntner was pointed out, we recorded a specimen of this species from Jalapa, Vera Cruz.³⁵

Latindia dohrniana Saussure and Zehntner

1894. *Latindia dohrniana* Saussure and Zehntner, Biol. Cent.-Am., Orth., 1, p. 111, pl. v, fig. 7. [♀, Guatemala.]

Motzorongo, Vera Cruz, II, 1892, (L. Bruner), 2♂, 1♀.

Holocompsa nitidula (Fabricius)

1781. *B[latta] nitidula* Fabricius, Spec. Ins., 1, p. 345. [[♀], Surinam.]

Vera Cruz, (Rev. T. Heyde), 1♀. Minatitlan, Vera Cruz, II, 1, 1892, (L. Bruner), 1♂.

POLYPHAGINAE

Homoeogamia mexicana Burmeister

1838. *H[omoeogamia] mexicana* Burmeister, Handb. Ent., II, abth. II, pt. 1, p. 490. [♂, ♀; Mexico.]

Guadalajara Jalisco, 1♂, 2♀, 3 juv. ♂, 1 juv. ♀, [Paris Museum]. Huejotitlan, Jalisco, 1700 meters, 1♂, [Paris Museum]. Sierra de Zacapoaxtla, Puebla, 1♀, [Paris Museum]. Puebla, Puebla, 1♂, [Paris Museum].

³⁴ Mem. Am. Ent. Soc., no. 2, p. 212, (1920).

³⁵ Mem. Am. Ent. Soc., no. 2, p. 210, (1920).

We have previously discussed this species, having examined it from Guanajuato, Guanajuato; Jalapa, Vera Cruz; Tacubaya, Distrito Federal; Uruapan, Michoacan, and Guadalajara, Jalisco.⁶

OXYHALOINAE

Chorisoneura pellucida (Saussure)

1864. *Blatta* *pellucida* Saussure, Rev. et Mag. de Zool., (2), xvi, p. 311. [1 ♀], Mexico.]

San Rafael, Vera Cruz, (C. H. T. Townsend), 1 ♂.

Chorisoneura translucida (Saussure)

1864. *Blatta* *translucida* Saussure, Rev. et Mag. de Zool., (2), xvi, p. 311. [1 ♀], Mexico.]

San Rafael, Vera Cruz, (C. H. T. Townsend), 2 ♀.

Additional material from this region is needed in order that *translucida* may be fully defined, and the status of *C. mysteca* (Saussure) determined.

⁶ Mem. Am. Ent. Soc. no. 2, p. 221, (1920). At that time the Polyphaginae in the present collections were all treated in detail, Mexican material being represented as follows:

Arenivaga rehnii Hebard. San Pedro, Sierra el Tosti, Comondu and San José del Cabo, Lower California. (We have subsequently stated that the material recorded from Jojutla, Morelos and Iguala, Guerrero, can not be assigned to this species without considerable uncertainty.)

Arenivaga erratica Rehn. State of Sonora.

Arenivaga apache (Saussure). Sierra de San Francisco, Sonoita, Sonora.

Eremoblatta hirsuta Hebard. Sierra el Tosti, Comondu, San José del Cabo and Cape San Lucas, Lower California.

EXPLANATION OF PLATE XIII

- Fig. 1.—*Anaplecta saussurei* new species. Dorsal outline of male tegmen. Vera Cruz, Vera Cruz, Mexico. *Type*. ($\times 8.5$)
- Fig. 2.—*Latiblattella picturata* new species. Cephalic view of male head. San José del Cabo, Lower California, Mexico. *Type*. ($\times 11$)
- Fig. 3.—*Latiblattella picturata* new species. Dorsal view of male pronotum. San José del Cabo, Lower California, Mexico. *Type*. ($\times 6.5$.)
- Fig. 4.—*Latiblattella picturata* new species. Dorsal view of distal portion of male abdomen. San José del Cabo, Lower California, Mexico. *Type*. (Greatly enlarged.)
- Fig. 5.—*Latiblattella picturata* new species. Distal outline of tarsal claws and arolium. San José del Cabo, Lower California, Mexico. *Type*. (Greatly enlarged.)
- Fig. 7.—*Latiblattella picturata* new species. Dorsal view of male pronotum. Venvidio, Sinaloa, Mexico. *Paratype*. Showing intensive coloration. ($\times 6.5$)
- Fig. 8.—*Latiblattella picturata* new species. Dorsal view of female pronotum. San Jorge, Lower California, Mexico. *Allotype*. ($\times 6.5$)
- Fig. 9.—*Epilampra maya brachyptera* new subspecies. Dorsal view of male. Minatitlan, Vera Cruz, Mexico. *Type*. ($\times 2.5$)
- Fig. 10.—*Epilampra maya brachyptera* new subspecies. Dorsal outline of female. Minatitlan, Vera Cruz, Mexico. *Allotype*. ($\times 2.5$)
- Fig. 11.—*Panchlora mexicana* Saussure. Ventral view of distal portion of male abdomen. San Rafael, Vera Cruz, Mexico. (Greatly enlarged.)

GOMPHUS DILATATUS, VASTUS AND A NEW SPECIES, LINEATIFRONS

(ODONATA)

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(With Plates XIV and XV)

Abstract

This paper points out that two species have been confused under the name of *Gomphus dilatatus*: the true *dilatatus* of Rambur, known only from Georgia and Florida, and a form in the northern states for which the name *lineatifrons* is proposed. The differentials are listed and many of them figured. *G. vastus* Walsh is the northern representative of *dilatatus* Rambur and its characters are briefly enumerated. A comparison of the existing data on the larvae of the three forms is given.

In the summer of 1917, the late V. A. E. Daecke gave me two females of a large *Gomphus* which he had taken at Weaver, Pennsylvania, a short time before. They were, apparently, of the species referred to in recent literature as *Gomphus dilatatus* Rambur. As this species had not been recorded from Pennsylvania, if indeed from as far east, I studied them rather minutely. It soon became apparent that they differed in a number of details from the descriptions of the type of the species, wherefore I was led to a more extended study. Specimens from Florida most closely approached the original of Rambur. The evidence at hand seemed to point to the existence of a typical southern form and an atypical northern form. Later in the summer of 1917, at the Museum of Comparative Zoology, I studied such material as that rich institution possessed. Mr. E. B. Williamson, with his usual liberality, placed his *dilatati* at my convenience. Prof. J. G. Needham lent me two males, one female and some larval exuviae from Georgia and Florida. Prof. C. B. Wilson, of Westfield, Massachusetts, put a female from Tennessee at my disposition. Mr. Nathan Banks supplied additional information on the specimens in the Museum at Cambridge, and, with the return of peace, M. G. Severin, of the

Musée Royal d'Histoire Naturelle, at Brussels, has furnished both notes on and drawings from Rambur's type of *dilatatus* now in that collection. Few specimens from the Southern States appear to exist in collections. Mr. R. P. Currie wrote in March, 1919, that there were none in the United States National Museum; a "want" notice in the exchange page of the "Entomological News" from February to July, 1919, brought forth only a single specimen, which came from that untiring helper, Mr. W. T. Davis. To all these friends I return hearty thanks for their assistance.

Perhaps this paper will attract the attention of collectors in the South to the desirability of further knowledge of this species—our largest representative of the genus *Gomphus*.

On account of the differences set forth below I propose to regard the northern form as a distinct species under the name of

***Gomphus lineatifrons* new species.**

Black on most parts of the body less extended than in the typical southern *dilatatus*. The differences which I have found are as follows:

Both Sexes

1. Hind margin of the occiput (when the head is viewed from in front so that the top of the frons and the tip of the vertex coincide): in *dilatatus* not projecting, or but slightly projecting, above a line drawn from the top of one eye to the top of the other eye; in *lineatifrons* distinctly projecting above the eye to eye line. (See also no. 20 below.)
2. Black on the suture between frons and nasus (post clypeus): in *dilatatus* a stripe or band 1.11 to 1.4 mm. wide and covering half the height of the frons and half the height of the nasus; in *lineatifrons*, a line or a narrow stripe .44 mm. wide at most (Livingston ♂).
3. Rhinarium (ante-clypeus): in *dilatatus* black (or in part pale green, Thaxter's ♂), this black continued transversely on to each side of the nasus where it encloses the rhinarium; in *lineatifrons* pale green except for a little blackish at the extreme infero-lateral angles, no black on the enclosing sides of the nasus.
4. Labrum in both forms with two transverse marginal black stripes, one at the base, the other at the apex; pale green area between these black stripes occupies: in *dilatatus* one-third to one-half (♂), three-fifths to two-thirds (♀), of the total height of the sclerite; in *lineatifrons* from .64 to .71 of the same height. In specimens of both forms there may be present an isolated central brownish or blackish spot in the midst of the green, or a prolongation in the median line from the basal black stripe toward, or to, the apical stripe.
5. Hind prothoracic lobe black: in *dilatatus* with no pale spot; in *lineatifrons* with a single or double, median, greenish spot.

6. Lateral margins of the dark brown mid-dorsal thoracic stripe: in *dilatatus* (Plate XIV, fig. 13) diverging strongly cephalad (from 1.5 to 1.63 mm. ♂, 1.7 to 2.22 mm. ♀, posteriorly to 2.96 to 3.11 mm. ♂, 3.33 mm. ♀, anteriorly)¹; in *lineatifrons* (Plate XIV, fig. 11) subparallel or but slightly diverging cephalad (from 1.18 to 1.92 mm. ♂, 1.7 to 1.85 mm. ♀, posteriorly to 1.70 to 2.0 mm. ♂, 2.07 to 2.15 mm. ♀, anteriorly).

7. Width of the first pale green antehumeral stripe compared to the width of the adjoining half of the dark brown mid-dorsal stripe at mid-height: in *dilatatus* two-thirds to subequal (♂) .67 (♀); in *lineatifrons* 1.18-2. (♂), 1.2 (♀).

8. Width of the second pale green antehumeral stripe compared to the width of the dark brown stripe immediately preceding it at mid-height: in *dilatatus* .5-.67 (♂), .4-.625 (♀), and not interrupted; in *lineatifrons* .2-.33 and more often interrupted near its upper end, or obliterated in its upper third or fourth by fusion of the brown antehumeral and humeral stripes (♂), .15-.22 and not interrupted (except in one Weaver ♀ and on the left side only of the Jellico ♀).

9. Black stripe on the obsolete first lateral thoracic suture: in *dilatatus* not interrupted (except in Thaxter's ♂); in *lineatifrons* distinctly interrupted in its upper half (except in two of the four Tippecanoe ♂♂).

10. Pale markings on the mid-dorsum of abdominal segment seven reaching from the anterior end: in *dilatatus* to three-fifths (♂), four-fifths (♀), of the segment's length, pale green or greenish yellow; in *lineatifrons* to one-half (♂), two-thirds or three-fourths (♀), of the segment's length, bright yellow in both sexes (except in one Weaver ♀, in which they are greenish yellow, and pale green in the Jellico ♀).

11. Expanded lateral margins of abdominal segment eight: in *dilatatus* more convex, in *lineatifrons* less convex (cf. Plate XV, figs. 1, 2).

12. Antenodals on the front wings: in *dilatatus* 12 to 15, 13 most frequent (4 ♂, 2 ♀); in *lineatifrons* 13 to 19, 16 and 14 most frequent (8 ♂ 5 ♀).²

13. Antenodals on the hind wings: in *dilatatus* 9 to 10, equally frequent (4 ♂ 2 ♀); in *lineatifrons* 9 to 13, 10 most frequent (8 ♂ 5 ♀).

14. Size: *dilatatus*, abdomen ♂, 46 to 52, average of four 49.5; ♀, 47 to 52, average of two (Rambur's type, teste Selys, and Spring Creek ♀) 49.5; hind wing ♂, 34 to 40, average 37.75; ♀, 40 to 43, average 41.5 mm.; *lineatifrons*, abdomen ♂, 46 to 50, average of eight 48.5; ♀, 46 to 52, average of five 48.6; hind wing ♂, 39 to 41, average 39.6; ♀, 40 to 45, average 42.5 mm.

¹ Of *dilatatus* only the males from Mrs. Slosson and from Johnson's Island and the two females were measured, but no striking difference therefrom was noted in the two males in the Museum of Comparative Zoology. All of the eight males and two females of *lineatifrons* not in the Museum of Comparative Zoology were measured. All these measurements are by eyepiece micrometer in a Zeiss binocular, oc. 4, obj. F. 55.

² In the Minnesota male of *lineatifrons* the discoidal triangle of both front wings is two-celled; in all the other material which I have examined, of both northern and southern forms, this triangle is free. Kellicott mentions one male [of *lineatifrons*] "in which the triangles are all one crossed" (Odon. Ohio, p. 57).

Males

15. Lateral labial lobes: in *dilatatus* chiefly brown; in *lineatifrons* chiefly greenish.

16. Superior abdominal appendages in dorsal view: in *dilatatus* angulate on the lateral margin at .55 to .67 of their length corresponding to the infero-lateral tooth; in *lineatifrons* rounded off at the same place; in profile view the appendages are more robust and the tooth placed a little more distad in *lineatifrons* (cf. figs. 14-16, 18, Plate XV).

17. Genital hamules: in *dilatatus* less robust; in *lineatifrons* more robust (cf. Plate XV, figs. 17 and 20).

18. Posterior margin of the vesicle of the penis when fully extended and in profile view: in *dilatatus* 1.33 mm. in height, or .36 as high as the hind margin of abdominal segment two; in *lineatifrons* 1.7 mm. in height or .48 as high as the hind margin of segment two (only one male of each form has been measured in extended condition, however. Cf. Plate XV, figs. 21, 22.)

Females

19. Vulvar lamina: in *dilatatus* reaching to .47 (drawing of the ♀ type) or .37 (Spring Creek ♀) of the length of the sternite of nine, narrowed distad so that at two-thirds' length it is but half as wide as at base, distal fifth bifid, the divisions acuminate, more acute in the two females I have examined than in the drawing from Rambur's type; in *lineatifrons* reaching to .51 to .55 of the length of the sternite of nine, narrowed to two-thirds its basal width at one-third of its length, thence widened so that at two-thirds' length it is almost as wide as at base, distal fourth bilobed, each lobe broadly rounded (compare Plate XIV, figs. 8-10), or even truncated at tip in the Jellico ♀.

20. Hind margin of the occiput, viewed from in front but also from a more superior or dorsal position than that indicated under no. 1 above: in *dilatatus* almost straight and entire, in *lineatifrons* widely and shallowly excavated in the middle, a convexity on each side of the median excavation (cf. figs. 3, 5, Plate XIV). (Males of both forms have the hind margin distinctly convex, although with the difference mentioned under no. 1 above).

The references in the literature to these two forms and the material which I have studied are as follows:

Gomphus dilatatus

1842. Rambur, Hist. Nat. Ins. Névr., p. 155. [♀ "l'Amerique septentrionale".]

1854. Selys, Bull. Acad. Roy. Belg., xxi, pt. II, p. 47 (Synop. Gomph. p. 28). [♂ ♀ "États-Unis".]

1858. Selys & Hagen, Monog. Gomph., p. 123, pl. 7, figs. 3 a-m. [Details of both sexes figured. "Les États-Unis, d'après le type femelle décrit par M. Rambur, qui fait partie de ma collection, et un mâle appartenant à M. Hagen."]

1861. Hagen, Syn. Neur. N. Amer., p. 103. [♂ ♀ "Georgia (Abbot)."]

1863. Hagen, Stet. Ent. Zeit. xxiv, p. 373. ["Type in Escher's Sammlung. Abbildung 14. Männchen: 24. Mai, not very common." Georgia, Abbot.]
1874. Hagen, Proc. Bost. Soc. Nat. Hist. xvi, p. 359. ["Male No. 14. Brit. Mus. May 24. Not very common. I possess a male type from Abbot." Georgia.]
1875. Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 46. ["♂ ♀ Georgia, May 24; Florida; Lansing, Mich." All this reference belongs here except the locality Lansing, Mich.]
- Aeshna dilatata*. 1890. Kirby, Cat. Odon., p. 66. ["S. States, Michigan." All of this reference except "Michigan" belongs here.]
- Gomphus dilatatus*. 1893. Slosson, Journ. N. Y. Ent. Soc. i, p. 150. [Suwanee Springs, Florida.]
1903. Needham, Proc. U. S. Nat. Mus. xxvi, pl. xxxiii, fig. 1 [♂ venation.]
1910. Muttkowski, Cat. Odon. N. Amer. (Bull. Publ. Mus. Milwaukee, I, 1), p. 91. ["Ga. to N. Y. & Mich., Ill." In part only.]

Material studied: ♂ Florida (probably Suwanee Springs), Mrs. A. T. Slosson, in the writer's collection at The Academy of Natural Sciences of Philadelphia.

♂ with label "*Gomphus dilatatus* Rbr. ♂" in Hagen's handwriting and the printed label "Hagen" (no locality label); ♂ with label "Florida Thaxter" in Hagen's handwriting; both in the Museum of Comparative Zoology, Cambridge, Massachusetts.

♂ ♀ Johnson Island, Osceola County, Florida, A[dolph] H[empel], ♂ March 23, 1897, ♀ March 28, 1897. ♀ Spring Creek, Decatur County, Georgia, June 7 to 23, 1911, J. C. Bradley. These three in the Cornell University collection. The Johnson Island ♀ has the abdomen incomplete and the hind wings not fully expanded.

Comment on the literature and material

Rambur in his original description (1842) says: "Je ne connais que la femelle . . . Un peu plus de huit centim. d'envergure et de sept de long. . . . Abdomen . . avec une ligne jaune en dessus, qui s'arrête avant le huitième, . . . dilatée sur le huitième."

There would seem to be a contradiction here as regards the yellow line on the dorsum of segment eight. DeSelys and Hagen in 1858, as noted above, had only one male and one female before them. The female was Rambur's type, whose dimensions are given as "Aile supérieure 42, aile inférieure 40, Longueur totale 65 mm." Their description of the female is brief and comparative with that of the male; no difference in the markings of the abdomen from those of the male are mentioned; the latter is said to have "une bande dorsale maculaire (jaune) sur les sept

premiers segments," with no mention of any dorsal pale marking on segment eight. Their testimony is of about the year 1855. M. Severin writes of this type in 1921 as having "8me segment sans ligne claire median." Of the material which I have studied only the male from Mrs. Slosson has any pale dorsal spot on segment eight—a small green (?) spot at the mid-base. The *Monographie* (1858) says of the female's abdomen: "le 10e offre une carène dorsale," which is not found on any female of either of these two forms which I have seen. On this point M. Severin writes of the type: "10me segment cassé mais je crois sans carène."

It would seem reasonable to identify the male cited above as in the Museum Comparative Zoology without locality label, as that quoted in the literature of 1858, 1861, 1863 and 1874, in which case its provenance would be Georgia. It agrees with the description of 1838, and it may have been collected in Scriven County, according to the data concerning Abbot brought together by Scudder.² "Thaxter," on the label of the other M. C. Z. male, is, doubtless, the collector's name, Prof. Roland Thaxter, of Cambridge. Prof. Needham writes me that his figure of the venation (1903) was made from the male from Johnson Island, Florida.

Gomphus lineatifrons new species

Gomphus dilatatus. 1875. Hagen, Proc. Bost. Soc. Nat. Hist., xvii, p. 46. [The Lansing, Mich., locality only.]

Aeshna dilatata. 1890. Kirby, Cat. Odon., p. 66. [Only the Michigan locality.]

Gomphus dilatatus. 1896. Kellicott, Journ. Cincinnati Soc. Nat. Hist., xviii, p. 106. [♂, South Columbus, Ohio.]

1899. Kellicott, Odon. Ohio, pp. 55, 56. [Central Ohio.]

1900. Williamson, 24th Ann. Rept. Dept. Geol. Indiana, pp. 285, 286, pl. vi, f. 6 [♂ appx]. [In part.]

1901. Williamson, Proc. Indiana Acad. Sci., pp. 120, 123. [Tippecanoe River, near Warsaw, Indiana; Illinois.]

Gomphurus dilatatus. 1903. Needham, Bull. 68, N. Y. St. Mus., p. 265, fig. 14. [Labium of nymph, Elkhart, Indiana.]

Gomphus dilatatus. 1904. Butler, Trans. Amer. Ent. Soc. xxx, p. 126, pl. vi, fig. 1 f. [Ligula of nymph.]

1905. Williamson, Ohio Naturalist, v, p. 310. [Livingston, Kentucky.]

1908. Muttkowski, Bull. Wisconsin Nat. Hist. Soc., vi, p. 83.

² The Butterflies of the Eastern United States and Canada, Vol. i, pp. 651-2.

1910. Muttkowski, Cat. Odon. N. Amer. (Bull. Publ. Mus. Milwaukee, 1, 1), p. 91. [In part "N. Y., Mich., Ill."]
 1912. Wilson, Proc. U. S. Nat. Mus. Vol. 43, p. 191. ["A single female was taken at Jellico, Tennessee, June 28, on the Clear Fork of the Cumberland."]
 1917. Williamson, Univ. Michigan Mus. Zool., Misc. Publ., no. 2 p. 8. [Crawford and Kosciusko Counties, Indiana.]

Material studied: Type, ♀, Weaver, Perry County, Pennsylvania, June 17, 1917, taken by the late Mr. V. A. E. Daecke, in the writer's collection at The Academy of Natural Sciences of Philadelphia. Twelve *paratypes* as follows: A second female from Weaver, same date, collector & collection.

1 ♀ Minnesota, without further data, same collection.

♀ "Michigan Lansing, Cook"; ♀ "Pennington Gap, Va. 6.22"; both in the Museum of Comparative Zoology, Cambridge, Mass.

1 ♂ Tippecanoe River, Indiana, 6-23-1901, taken by E. B. Williamson and Holliday; 2 ♂ Creek at Indian Village, Noble County, Indiana, July 1, 1917, by E. B. Williamson; 1 ♂ Livingston, Kentucky, 6-23-01, by the same; all seven in Mr. Williamson's collection.

♀ Jellico, Tennessee, in Prof. C. B. Wilson's collection.

Comments on the literature and material

The descriptions of "dilatatus" referable to this species can usually be identified from some detail of coloration or of structure corresponding to one of the differentials listed above. In Kellcott's description of 1899, "fore tibiae" should be corrected to "fore femora," "apical" in the last two lines on page 55 to "basal" and, in the eighth line from the bottom of the same page, perhaps "widely" might be omitted. Mr. Williamson (1901, p. 123) has corrected "apical" to "basal" in his description (1900, p. 286, next to last line). Dr. Muttkowski's statement (1908, p. 83) for "dilatatus:" "Abdominal segments 8-9 black" does not apply to either the northern or the southern form, unless one understands that this is limited to the dorsal surface only, although "a small but distinct yellow basal spot on the eighth abdominal segment" was noted by Mr. Tough in a male from Illinois (Williamson, 1901, p. 123). I have not found the data on which Dr. Muttkowski's citation (1910) of New York as part of the area inhabited by this species is founded; Prof. Needham's description of the larva (1903), although published in a New York State Bulletin, was based on a specimen from Indiana. The female from Tennessee is that referred to in Prof. Wilson's paper of 1912.

Gomphus vastus Walsh

It will be noticed that *dilatatus* as above defined is very similar to the form known in our literature as *Gomphus vastus* Walsh. De Selys, in redescribing *vastus* in 1869, said of it: "Excessivement voisin du *dilatatus*. Il en diffère principalement par la taille moindre,"⁴ remarks which would be far less appropriate, applied to the northern form which has passed as *dilatatus* and which it is now proposed to call *lineatifrons*. Most of the differences which are given above to separate *lineatifrons* from *dilatatus* will also serve to distinguish *lineatifrons* from *vastus*. *Vastus* differs from *dilatatus* as follows (using the same numbers for the differentials as above):

2 Width of the black band on the fronto-nasal suture absolutely less (.6 to .74 mm.) and relatively narrower, occupying less than half the height of the front and less than half the height of the nasus.

10. Pale marking (yellow) on the mid-dorsum of abdominal segment seven smaller, reaching from the anterior end to two-fifths or to one-half of the segment's length.

14. Size smaller: abdomen ♂ 37 to 41, ♀ 35 to 41; hind wing ♂ 29 to 31, ♀ 31 to 34 mm.

20. ♀. Hind margin of the occiput, in antero-superior view, more widely excavated even than in *lineatifrons*, showing no slight convexity between the median emargination and each lateral extremity such as is visible in our figure 3, Plate XIV; in dorsal view bent more "forward in the middle," as Walsh noted in his original description, than in either *dilatatus* or *lineatifrons*.

21. ♂. Tooth of the penis more slender, more acute (cf. Plate XV, figs. 21, 23).

22. ♀. A conical spine on the vertex between each lateral ocellus and the adjoining eye, absent in *dilatatus* and in *lineatifrons* (cf. Plate XIV, figs. 3 to 7).

Among the material of *vastus* which I have examined is a female from Buckingham County, Virginia, June 21, 1919, collected by Mr. Wm. T. Davis and in his collection. Both Mr. Davis and I had, at first, referred it to *dilatatus*, but I now believe that it is *vastus*, as it agrees with the latter in the distinctions just given under numbers 10 and 22. It is larger than any other *vastus* that I have seen or whose dimensions are given in the literature, viz.: abdomen 44, hind wing 35.5 mm.; it is still smaller than the smallest female of *dilatatus*. Its occiput (fig. 6), on the other hand, is nearer to that of *dilatatus* than to that of *vastus*, while its black fronto-nasal band is narrower (.4 mm.) than in either.

All these facts, together with its locality suggest that more material collected between Virginia and Georgia may show *vastus*

⁴ Bull. Acad. Roy. Belg., (2) xxviii, p. 177, or 2des Addit. Syn. Gomph., p. 14.

to occupy the position of a subspecies of *dilatatus* into which it may grade geographically. *Vastus* in the north, from New York and Iowa to Pennsylvania and Tennessee (Muttkowski 1910), therefore, represents *dilatatus* of the south, from Virginia to Florida, while *lineatifrons*, hitherto confused with *dilatatus* and with a range similar to (but not, in present knowledge, identical with) that of *vastus*, is more distinct from the other two forms than they are from each other.

LARVAE

Prof. Needham has also sent me three exuviae from Spring Creek, Decatur County, Georgia, June 7 to 23, 1911, collected by Prof. J. C. Bradley, labeled "*Gomphus dilatatus*?" A comparison of these with Hagen's description⁵ of bred exuviae of *Gomphus vastus*, and with Prof. Needham's description⁶ of a supposed *Gomphurus dilatatus* skin from Indiana, which, from its locality is very probably that of *lineatifrons*, gives the following differences:

Size: *dilatatus* (Georgia), total length, 37 to 40 mm., maximum width of abdomen (segment six) 9 to 10 mm.; *vastus*, length 31 mm.; *lineatifrons*, 38 and 10 mm.

Hairiness: *dilatatus*, hairs on sides of the head, antennae, femora and tibiae; *vastus*, body . . . little hairy"; *lineatifrons*, "but little hairy except on the sides of the head, antennae and tibiae."

Third antennal joint: *dilatatus*, twice as long as one and two (antennae lacking in two of the three exuviae); *vastus*, "twice the length of the two basal"; *lineatifrons*, "thrice as long as the two first segments together."

Median labial lobe: *dilatatus*, distal margin almost straight or slightly convex, with a fringe of closely-set scales; *vastus*, "middle third of front border straight, with longer comb of flat scales"; *lineatifrons*, "median lobe in front with a deep semicircular concavity, the sides of which are thinly fringed with flattened hairs or scales." Figure 14, accompanying Prof. Needham's description, shows the form very clearly.

Mid-dorsal abdominal hooks: *dilatatus*, on segments eight and nine only; *vastus*, "on 8th to 9th, short tubercles," *lineatifrons*, "very rudimentary, on segments 7-9 only."

Abdominal segment ten compared to nine: *dilatatus*, variable, one-third to one-fourth as long mid-dorsally; *vastus*, "one-third of 9th"; *lineatifrons*, (not mentioned).

Lateral spines of abdominal segment nine: *dilatatus*, variable in length relative to segment ten, always longer but in no case twice as long; *vastus*, "as long as 10th"; *lineatifrons*, "twice as long as the tenth."

⁵ Trans. Amer. Ent. Soc. xii, p. 265. 1885.

⁶ Bull. 68, N. York State Mus., p. 266. 1903.

Lateral terminal abdominal appendages [cerceoids" of Heymons]: *dilatatus* one-fourth shorter than the dorsal appendage; *vastus*, "one-third shorter"; *lineatifrons*, "one-fourth shorter."

It will be seen that, if the very few exuviae examined for each one of these three species represent normal conditions therein, *dilatatus* and *vastus* are in most respects more nearly alike than either of them is to *lineatifrons*. The chief exceptions are in size and in the relative length of the lateral terminal abdominal appendages. Prof. Needham has, in a letter, called his Indiana exuvia into question, writing:

"The figure of the nymphal labium of this species that I published in New York State Museum Bulletin 68, page 266, I now believe was drawn from an injured specimen but unfortunately I can not now find the specimen. The deep concavity of the median lobe may have been the result of an injury. At any rate, the nymph from Spring Creek, Ga., had a different labium. . . . If the one I figured is normal (and the complete fringe of marginal hairs certainly gives no indication of injury), then I should think there has been some mixing of species under the name *dilatatus*."

Inasmuch as the evidence from both imagoes and exuviae set forth in this paper is in agreement and the latter confirm the conclusion drawn above, there seems to be no reason for doubting that the Indiana exuvia is normal. The testimony of additional larvae would, nevertheless, be very welcome.

POSTSCRIPT.—After this paper had been put into type, Mr. Williamson sent me a male and a female *Gomphus* labeled, "Amite River, Louisiana, 5.28.99 Ed. Foster. Fragments received in bottle years ago." Of the male there are the head, thorax, abdominal segments one to three, six to ten, the superior (but not the inferior) abdominal appendages, one front wing and both hind wings. The female is complete except for abdominal segments four and five and the vulvar lamina. In the thoracic characters (nos. 5-9) of both sexes, in the male features (15-17) and in the shape of the occiput (1 and 20) these two specimens are *dilatatus*. The face, on the other hand, (nos. 2 and 4) is as in *lineatifrons*, while the rhinarium (no. 3) is intermediate in that it is apparently entirely brown, but there is no brown or black on the enclosing sides of the nasus. The hind wing of the male measures 33, of the female, 36 mm. Antenodals, front wing, ♂ 14, ♀ 15 and 12. Antenodals, hind wing, ♂ ♀, 9.

ERRATA.—Two corrections to papers on Odonata in earlier volumes of these Transactions may be noted here: Vol. XLV, page 378, fifth line from bottom for "1 ♀, 1 ♀" read "2, 1 ♀". Vol. XLVI, page 326, line fifteen, insert "1 ♂" after "August 1, 1909".

The exact data for the three Georgia exuviae of *dilatatus* are: mid-dorsal length of ten, .85, .74, .96; lateral margin of ten, 1.11, 1.11, 1.33; lateral spines of nine extend beyond lateral margin of ten by .45, .15, .07; mid-ventral length of ten, 1.26, 1.33, 1.48, respectively. All measurements in millimeters.

EXPLANATION OF PLATES

Plate XIV

All the figures on this plate have been drawn from females only. Excepting figures 10 and 12, they have been made with the aid of a camera lucida and compound microscope, Zeiss compensating ocular 2, objective A with the lower lens removed.

Fig. 1. *Gomphus dilatatus* Rambur. Left lateral margin of abdominal segment eight, supero-lateral view at about 45° with the sagittal plane. $\times 9.6$.

Fig. 2. *Gomphus lineatifrons* new species, corresponding to fig. 1. $\times 9.6$.

Fig. 3. *Gomphus lineatifrons* new species. Supero-anterior view of occiput and vertex; *lo*, lateral ocellus; *tr* transverse vertex ridge, posterior to the ocelli. $\times 11.3$.

Fig. 4. *Gomphus lineatifrons* new species. Transverse vertex ridge and ocelli viewed from behind. $\times 11.3$.

Fig. 5. *Gomphus dilatatus* Rambur. Supero-anterior view of occiput (*oc*) and vertex. $\times 11.3$.

Figs. 6, 7. *Gomphus castus* Walsh. Buckingham County, Virginia, June 21, 1919. 6, Supero-anterior view of occiput and vertex. 7, Transverse vertex ridge and ocelli viewed from behind. *lo*, lateral ocellus; *mo* median ocellus; *sp* vertex spine, between lateral ocellus and compound eye. $\times 11.3$.

Fig. 8. *Gomphus dilatatus* Rambur. Vulvar lamina. $\times 11.3$.

Fig. 9. *Gomphus lineatifrons* new species. Ventral view of ninth abdominal segment showing the vulvar lamina (*vl*). $\times 11.3$.

Fig. 10. *Gomphus dilatatus* Rambur, corresponding to figure 9. This figure was made from the type specimen in the Brussels Museum by the kindness of M. G. Severin, who writes that it bears these labels: "coll. Latreille", papier blanc, l'écriture d'un inconnu; 'Amer. sept.' papier blanc, encre rouge, écrit par inconnu; étiquette en papier doré sans écriture a été placé par Rambur sur tous les insectes de la collection Latreille pour les reconnaître; 'Gomphus dilatatus R. ♀' papier blanc avec l'écriture de DeSelys." \times about 11.

Fig. 11. *Gomphus lineatifrons* new species. Dorsal view of right half of thorax to show color pattern; *hs* black humeral stripe; *md* dark mid-dorsal stripe; *la* first pale antehumeral stripe. $\times 5.75$.

Fig. 12. *Gomphus dilatatus* Rambur. Diagram of the color pattern of the right half of thorax of Rambur's type, by M. G. Severin. For labels of this specimen see explanation of fig. 10 above. Of his original diagram, here copied, M. Severin writes: "Ces dessins sont d'un brun plus ou moins pale. La partie rouge [here represented by the dotted area *h*] est un trou. À gauche du thorax il y a une couche de gomme laque qui cache le tout." The lettering of the pattern is the writer's [P.P.C.]: *hs* dark humeral stripe; *ld* dark stripe on the obsolete first lateral thoracic suture; *2a* second pale antehumeral stripe.

Fig. 13. *Gomphus dilatatus* Rambur. Dorsal view of right half of thorax to show color pattern; lettering as in figs. 11 and 12. $\times 5.75$.

Figs. 1, 5, 8 and 13 of *Gomphus dilatatus* have been drawn from the female from Spring Creek, Decatur County, Georgia, June 7-23, 1911.

Figs. 2, 3, 4, 9 and 11 of *Gomphus lineatifrons* have been drawn from the type female from Weaver, Pennsylvania, June 17, 1917.

Plate XV

All the figures on this plate have been drawn from males only with the aid of the same optical apparatus as mentioned for Plate XIV, magnification 11.3.

Figs. 14, 15. *Gomphus dilatatus* Rambur. 14, Left profile view of hind end of abdomen; 15, Dorsal view of right superior abdominal appendage.

Fig. 16. *Gomphus lineatifrons* new species. Left profile view of hind end of abdomen.

Fig. 17. *G. dilatatus* Rambur. Latero-ventral view of the left side of the genitalia of abdominal segment two.

Fig. 18. *G. lineatifrons* new species. Dorsal view of right superior abdominal appendage.

Fig. 19. *G. vastus* Walsh. Left profile view of the anterior and posterior hamules of the second abdominal segment.

Fig. 20. *G. lineatifrons* new species. Latero-ventral view of the left side of the genitalia of abdominal segment two, penis not extended; *vp* vesicle of the penis.

Fig. 21. *G. dilatatus* Rambur. Penis and vesicle of the penis, extended.

Fig. 22. *G. lineatifrons* new species. Penis and its vesicle extended.

Fig. 23. *G. vastus* Walsh. Penis and its vesicle extended; *tp* tooth of the penis.

Figs. 14, 15, 17 and 21 of *G. dilatatus* Rambur have been drawn from the male from Florida (probably Suwanee Springs) taken by Mrs. Slosson.

Figs. 16, 18, 20 and 22 of *Gomphus lineatifrons* new species, have been drawn from a male from Tippecanoe River, Indiana, June 23, 1901.

Figs. 19 and 23 of *Gomphus vastus* Walsh have been drawn from a male from Elkhart, Indiana, May 17, 1896, taken by R. J. Weith.

A LIST OF THE CRANE-FLIES TAKEN IN THE VICINITY OF HAZLETON, PENNSYLVANIA

(DIPTERA)

BY W. G. DIETZ, M. D.

Hazleton, Pa.

The material forming the basis of this paper was collected by the writer during the past twelve years and is contained in the latter's collections. Hazleton, Luzerne County, Pennsylvania, is located on one of the highest plateaus in the State. The highest points within its limits are about eighteen hundred feet above sea-level. It is situated in the middle anthracite coal field and immediately over the Hazleton coal basin, and extends beyond the North outcrop. Underlying the coal measures are strata of "Pottsville Conglomerate" and "Mauch-Chunk Red Shale." Overlying them, are beds of slate and sandstone.

The general topography of the region is hilly or mountainous, traversed by creeks, brooks and rills. The vegetation, erstwhile, consisted essentially of hard-woods, with a lesser percentage of soft-woods and conifers. Practically all the large trees have been cut down for use in the coal industry, and, to-day, scrub oak furnishes the principal growths of our hills.

As to the climatic conditions, it may be stated, that the winters are rather severe, with considerable snowfall; the summers are rarely oppressively hot, though here, as elsewhere, seasons vary. As to the life zones, the fauna belongs to the Canadian and Transition Zones, with a predominance of northern forms.

Probably ninety percent of the material here used has been collected in the north-western quadrant of the region and within one mile and a half from the city limits.

The principal collecting places examined are:

1. A swampy part of what is known as Hazle Park, north-west of and adjacent to the borough of West Hazleton, the latter adjoining Hazleton proper. This is open, swampy ground, consisting chiefly of decayed vegetable matter. Here the vegetation

consists chiefly of *Acer*—young growth—, *Sambucus*, *Smilax*, *Rubus*, *Lappa*, *Bidens* and *Polygonum*. North-west of the Park is a very wet brush-swamp. The principal vegetation here consists of *Alnus*, *Betula*, ferns, etc. These two areas are directly upon the "Pottsville Conglomerate" series.

2. A circumscribed locality, less than one-half mile from the city limits, and situated on the east side of the highway in a northerly direction, and known as Fisher's Hill. This is open woodland, the principal trees are oak, maple and some pines; of lower growth, *Rhododendron*, *Sambucus*, *Alnus* and *Smilax*. The lower and more swampy portion is overgrown with *Polygonum pennsylvanicum*, and several interesting species were taken here, notably *Dicranomyia pellucidiguttata*. This area is also upon the "Pottsville Conglomerate."

North-west, and about six miles distant, is the Conyngham Valley, an agricultural district, the floor of which is about six to eight hundred feet lower than the Hazleton plateau. To the south-east of this Valley, is Conyngham Mountain. At the foot of the latter, and directly below the Hazleton Country Club House, is a small, very wet locality, surrounded by meadow and field land. Here considerable collecting was done. This area lies upon the lower series of the "Mauch Chunk Red Shale."

About six miles further up the Valley, in a north-easterly direction, is St. Johns, a farming village, situated on the north-west side of the Wilkes-Barre and Hazleton Railway. It is traversed by the Nescopeck Creek—a stream of considerable size. Collecting here was done chiefly in the swampy region to the north-west of the Railway, in the woodland to the east of it, and along the banks of the creek. This area is also upon the lower series of the "Mauch-Chunk Red Shale."

The species recorded in the following list number 163, and twenty of these are described here as new. They are distributed in three families and thirty-eight genera. It is singular that some species, which were common, or at least of frequent occurrence, during the earlier years of my collecting, have become rare, or have not been observed at all in later years. The reverse is true of others. The number of crane-flies recorded in the last New Jersey list, 1909, is 138. A comparison of the two lists forces the conclusion, that intensive collecting, even in our Eastern States, will bring to light many, as yet unknown, forms.

Although increasing the size of this paper considerably, I have deemed it proper to add the bibliography of the original description, as in instances where the description by the same author appeared in two different publications, such as in most of Say and Loew's species. A generic name in brackets, following the bibliographical citation, indicates the name of the genus under which it was described originally. In the arrangement I have followed, with few exceptions, that of Alexander.¹

Family PTYCHOPTERIDAE

Subfamily PTYCHOPTERINAE

Genus **PTYCHOPTERA** Meigen

Ptychoptera Meigen, Illiger's Mag., II, p. 262.

Ptychoptera rufocincta Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 282.

June to August. Common in swampy localities.

Subfamily BITTACOMORPHINAE

Genus **BITTACOMORPHA** Westwood

Bittacomorpha Westwood, London and Edinburgh Phil. Mag., 1835, VI, p. 281.

Bittacomorpha clavipes Fabricius, Spec. Ins., p. 404 (*Tipula*); Mant. Ins., II, p. 323 (*id.*); Ent. Syst., IV, p. 239 (*id.*); Syst. Antl., p. 22 (*Ptychoptera*).

May to September. Swampy localities; common locally.

Genus **BITTACOMORPHELLA** Alexander

Bittacomorphella Alexander Proc. Acad. Nat. Sci. Phila., 1916, p. 545.

Bittacomorphella jonesi Johnson, Psyche, 1905, p. 75.

Conyngham Valley. August 15, 1911. A single male specimen taken.

Family RHYPHIDAE

Subfamily TRICHOCERINAE

Genus **TRICHOCERA** Meigen

Trichocera Meigen, Illiger's Mag., II, p. 262.

The species of this genus are in need of a critical revision,

¹ The Craneflies of New York, Part 1, 1919.

especially so in relation to those of other faunas. The species are common in early Spring and late Fall.

Trichocera bimacula Walker, List, 1, 1848, p. 84.

November 7, 1909, November 16, 1916. Only two specimens taken.

Trichocera hiemalis DeGeer, Ins., vi, p. 360, pl. xxi, fig. 1, 2, 5 (*Tipula*).

September 20, 1909, October 4, 1909.

Trichocera brumalis Fitch, Winter Insects of New York, p. 9, 1848.

Common in October and November.

Trichocera venosa spec. nov.

Brown; wing-veins seamed with fuscous.

Female, length, 6.5 mm.; wing, 7 mm.

General coloration brown. Head, rostrum, mouthparts and antennae concolorous. Thorax concolorous, the stripes not well-defined and but little darker than the narrower interspaces, the latter with a row of short white hairs, which are continued upon the scutum. The posterior margin of the scutellum with a row of short white hairs. Halteres pale, club infuscate. Legs obscure yellow; femora darkened at the apex; tibiae yellowish brown; tarsi fuscous; pilosity very short, appressed, dark, more evident on the posterior tarsi. Wings subfuscous, all the veins, except A^1 and A^2 , distinctly seamed with fuscous, most conspicuous along the cord and the veins beyond, and Cu and its branches; a fuscous spot close to the origin of Rs , the fuscous margin on basal deflection of R^{1+2} and $r-m$ and on the medial cross-vein, expanded into spots. The distance of the subcostal cross-vein from the origin of Rs equals Cu^1 . Abdomen dark brown, with scattered, short white hairs; a dark fuscous spot near the lateral margin of tergites two to five. Ovipositor dark yellow, and, as usual in the genus, curved downward.

Holotype.—♀; Hazleton, Pennsylvania. October 4, 1920.

It is with some temerity I add this species to a genus, the species of which, at least of North America, are ill-defined and greatly in need of a thorough revision. The above species is greatly at variance with any other known to me. Its nearest allies appear to be *bimacula* Walker and *maculipennis* Meigen. The wings, however, are much darker, aside from the fuscous seaming of the veins. In wing color it resembles *subsinnuata* Alexander, though a trifle darker; in the latter species, the wings are unicolorous.

Subfamily RHYPHINAE

Genus **RHYPHUS** Latreille

Rhyphus Latreille, Hist. Nat. Crust. et Ins., 1805, xiv, p. 291.

Rhyphus punctatus Fabricius, Mant. Ins., ii, p. 333 (*Rhagus*); Ent. Syst., iv, p. 274; (*id.*) Syst. Antl., p. 59 (*Sciara*).

June 25, 1905; July 3, 1909; September 7, 1910.

Family TIPULIDAE

Subfamily LIMNOBIINAE

Tribe *Limnobiini*Genus **GERANOMYIA** Haliday

Geranomyia Haliday, Ent. Mag., i, p. 154, 1833.

Geranomyia rostrata Say, Journ. Acad. Nat. Sci. Phila., iii, p. 22, 1823; Compl. Works, ii, p. 47 (*Limnobia*).

June to September. In wet places; not common.

Geranomyia canadensis Westwood, Ann. Soc. Ent. France, iv, p. 684, 1835 (*Limnobia rhynchus*).

August, September. Rather common in swampy situations.

Geranomyia costomaculata spec. nov.

Dark fuscous. Thoracic stripes obliterated. Costal margin of wing with three fuscous spots. Sc ends opposite origin of Rs.

Female, length, 5.5 mm.; wing, 6.5 mm.

Head dark fuscous; rostrum about as long as the thorax, thickened about the palpal insertion. Scapal joints of the antennae stout, first joint pale and about one-half longer than the second joint, this and the flagellum dark brown; flagellar joints moniliform, the outer joints somewhat elongated and attenuated. Thorax fuscous, overlaid with a grayish bloom; stripes obsolete. Scutel whitish. Pleura concolorous. Halteres pale, knob and end of pedicel dark fuscous. Wings pale-gray, semipellucid; the Sc ends a trifle beyond the origin of the sector, the latter markedly curved at its base; the basal deflection of Cu, at the fork of M in the left wing, a little before the forking; a dark fuscous costal spot at about one-third the wing length, a second at the origin of Rs inclusive of end of the subcostal vein, a third spot, large, rhomboidal, includes the stigma. Legs pale fuscous, long, slender; femora, tibiae and tarsal joints darker apically. Abdomen brown, sparsely hairy. Ovipositor pale brown, and rather short.

Holotype.—♀; Hazleton, Pennsylvania. May 27, 1920.

Agrees with *A. diversa* Osten-Sacken in the termination of the subcostal vein. The costal spots distinguish it from our other species.

Genus **DISCOBOLA** Osten-Sacken

Discobola Osten-Sacken Proc. Ent. Soc. Phila., p. 226, 1865; Mon. N. A. Dipt., iv, p. 97 (*Trochobola*).

Discobola argus Say, Long's Exped., App., p. 358; Complete Works, I, p. 243 (*Limnobia*).

Not common. July 2, 1917; September 9, 1914; September 9, 1910; September 11, 1920. Mr. Harry B. Weiss of the New Jersey Department of Agriculture has bred this species from *Polyporus albellus*.

Genus **RHIPIDIA** Meigen

Rhipidia Meigen, Syst. Besch., I, p. 153.

Rhipidia maculata Meigen, Syst. Besch., I, p. 153, pl. v, fig. 9 to 11.

Rare in July and August, common in September and even October.

Rhipidia domestica Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 208; Mon. N. A. Dipt., iv, p. 84, pl. iii, fig. 5.

A single male specimen, taken May 15, 1911. Conyngham Valley.

Genus **DICRANOMYIA** Stephens

Dicranomyia Stephens, Cat. Brit. Ins., II, p. 243, 1829.

Dicranomyia longipennis Schum., Beitr. zur Ent., I, p. 104, pl. I, fig. 2, 1829, (*Limnobia*).

I have never taken this species in numbers. June 13, 1912, May 12, 1912; August 30, 1913; August 10, 1914; September 17, 1910; September 15, 1914 and 1915; September 29, 1919. Very few specimens seen in later years.

Dicranomyia gladiator Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 212; Mon. N. A. Dipt., iv, p. 63, pl. iii, fig. 4.

Very common in a swampy place, overgrown with *Polygonum pennsylvanicum* L.; July.

Dicranomyia immodesta Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 211; Mon. N. A. Dipt., iv, p. 62.

Not common. July 27, 1910; September 27, 1919; May 28, 1919; Sept. 1, 1920.

Dicranomyia diversa Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 212; Mon. N. A. Dipt., iv, p. 61.

Rare. May 18, 1919; June 7 and 19, 1912; June 29, 1913; August 25, 1914.

Dicranomyia pudica Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 212; Mon. N. A. Dipt., iv, p. 64.

Rare. June 3, 1913; June 12, 1916.

Dicranomyia isabellina Doane, Journ. N. Y. Ent. Soc., viii, p. 183, pl. 7, fig. 5, 1900.

Infrequent. July 27, 1915; September 19, 1915; October 2, 1917.

Dicranomyia flavescens spec. nov.

Close to *brevivena*.

Male, length, 3.5 mm.; wing, 5.5 mm.

Head black, occiput grayish-silvery; rostrum dark yellow; palpi entirely fuscous. Antennae fuscous, rather robust, flagellar joints subcylindrical. Thorax dull yellow, a little darker above, the stripes faint, the median one divided by a pale line. Halteres pale brown, club dark brown. Legs pale yellow throughout, pubescence fine, very short. Wings yellowish, subpellucid, with an iridescent luster. The Sc ends about the length of the stigma before the origin of the sector; Sc¹ about as long as the stigma. Rs and R¹ + 1 subequal; cell 1st M² closed. Abdomen yellow, a trifle darker above.

Holotype.—♂; Hazleton, Pennsylvania. September 24, 1919.

Paratypes, two males, topotypic.

Differs from *brevivena* in its dull yellow thorax, indistinct stripes, the median one divided by a pale line, and the abdomen much less darkened above.

Dicranomyia pennsylvanica spec. nov.

Close to *flavescens*.

Male, length, 5 mm.; wing 5.5 mm.

Head, palpi and antennae fuscous; rostrum yellow: the first three joints of the antennae somewhat incrassate, rest of flagellum slender, joints ovoidal, longer than wide, with a dense, fine, pale pubescence. Thorax reddish-yellow, the median stripe reddish-brown, strongly marked, shining and extending upon the neck; the lateral stripes less distinct and extend upon the scutum. Pleura pale. Halteres pale, lightly infuscate apically, club dark fuscous. Legs pale, pubescence scarcely noticeable; tarsi infuscate towards the apex. Wings somewhat narrow, iridescent, pellucid; Sc ends just before origin of sector; Sc¹ about as long as the stigma, the latter pale; Rs

approximately twice the length of R^1+ ; cell 1st M^2 closed. Abdomen darker above, the tergites indistinctly margined with fuscous posteriorly; venter pale. Hypopygium brownish-yellow.

Holotype.—♂; Hazleton, Pennsylvania. July 20, 1920.

Distinguished from *flavescens* by the conspicuous, shining median stripe, and Rs nearly twice the length of R^1+^2 .

Dicranomyia brevivena Osten-Sacken, Mon. N. A. Dipt., iv, p. 66, 1869.

Not rare; September.

Dicranomyia diversoides spec. nov.

Very close to *diversa*.

Female, length, 4.5 mm.; wing, 5.3 mm.

Yellow; head above and face yellowish-gray; rostrum and palpi dark brown. Antennae yellowish; outer half of first scapal joint, and second scapal joint almost entirely, brown. Thorax entirely yellow, stripes obsolete, somewhat shining above. Pleura with a faint, whitish bloom. Halteres pale, knob fuscous. Legs pale yellow, finely pubescent; outer tarsal joints darker. Wings with a faint yellowish tint; stigma scarcely indicated; veins pale, R and Sc darker, the latter ends opposite origin of Rs; Sc^1 very long, approximately as long as the sector, the latter distinctly longer than R^1+^2 , the latter strongly curved; cell 1st M^2 closed. Abdomen yellow, with scant, dispersed, pale hairs. Ovipositor concolorous, short.

Holotype.—♀; Hazleton, Pennsylvania. August 4, 1920.

Although closely resembling *diversa* and *pubica*, it is at once distinguished from the former by Rs distinctly longer than R^2+^3 , from the latter by the very long Sc^1 , and from both by the dark brown rostrum.

Infrequent. August 11, 1913; September 19, 1913; September 27, 1919.

Dicranomyia badia Walker, List, i, p. 46, pl. xxi, fig. 20, (*Limnobia*); Osten-Sacken, Proc. Acad. Nat. Sci. Philada., 1859, p. 210, (*humidicola*); Mon. N. A. Dipt., iv, p. 72, pl. iii, fig. 2.

Rare. Not taken in recent years. August 15, 1911; September 21, 1910.

Dicranomyia helva Doane, Journ. N. Y. Ent. Soc., viii, p. 183, pl. vii, fig. 4.

Rare. September 15, 1914; September 30, 1915; October 7, 1913.

Dicranomyia halterata Osten-Sacken, Mon. N. A. Dipt., iv, p. 71, 1869.

Infrequent. May 27, 1916; September 24, 1918.

Dicranomyia ochracea Doane, Journ. N. Y. Ent. Soc., VIII, p. 182, pl. VII, fig. 1.

Rare. Only two specimens taken. August 11, 1913; September 5, 1917.

Dicranomyia gracilis Doane, Journ. N. Y. Jour. Ent. Soc., VIII, p. 184, pl. VII, fig. 1.

Not rare. June 7, 1910; July 27, 1915; August 1, 1918; September 2, 1915.

Dicranomyia distans Osten-Sacken, Proc. Acad. Nat. Sci. Philada., 1859, p. 211.

Rare. June 21, 1919; October 7, 1913.

Dicranomyia liberta Osten-Sacken, Proc. Acad. Nat. Sci. Philada., 1859, p. 209; Mon. N. A. Dipt., IV, p. 69, pl. III, fig. 3.

Very common. Damp situations; May to October.

Dicranomyia globithorax Osten-Sacken, Mon. N. A. Dipt., IV, p. 74.

Rather frequent. August to October.

Dicranomyia pubipennis Osten-Sacken, Proc. Acad. Nat. Sci. Philada., 1859, p. 211; Mon. N. A. Dipt., IV, p. 73, pl. I, fig. 2.

Common. June to October, in swampy places.

Dicranomyia varipes spec. nov.

Brownish yellow; Sc long, ends some distance beyond the origin of the sector. Tarsal joints three and four white.

Male, length, 5.5 mm.; wing, 6 mm.

Head brownish-yellow; rostrum yellow, short; palpi dark brown, extreme base pale; face yellowish-white. Antennae dark brown, four basal joints large, cyathiform, following joints diminishing in thickness, last three joints elongate, slender. Thorax shining, brownish-yellow above; stripes obsolete; a fine, dark fuscous median line; a similar line, limiting the space occupied by the lateral stripes; pronotum and lateral thoracic margin a little paler with a pale sheen. Pleura paler with a faint sheen, shining. Halteres rather short, pale brown, club dark fuscous, elongate and but little broader than the pedicel. Legs yellowish, tarsal joints three and four white, last joint almost black. Wings light grayish-fuscous, slightly darker in apical portion. Sc ends at a considerable distance beyond the origin of Rs, Sc¹ very short. Rs nearly twice the length of R¹+2, very slightly curved; stigma pale fuscous, cross-vein r heavily infuscated, cell 1st M² closed. Abdomen brown above, shining; venter yellowish-brown; eight sternite pale yellow. Hypopygium brownish-yellow; the lower appendages smaller than usual in this genus.

Female, length, 4 mm.; wing, 5.5 mm.

General aspect a little darker; basal joints of antennae less thickened. Ovipositor sordid yellow, short.

Holotype.—♂; Hazleton, Pennsylvania. September 19, 1912.

Allotype.—♀; topotypic, September 22, 1912.

Paratypes, seven males and seven females, typotypic, September 17 to 23, 1912. All bred from a fungus on the trunk of a dead birch tree.

The long Sc with the peculiar coloration of the tarsal joints readily distinguish this species from all others.

***Dicranomyia pellucidiguttata* spec. nov.**

Wings light fuscous, with pellucid spots and patches in all the cells; long; femora with a pale band before the apex.

Female, length, 7 mm.; wing, 7.5 mm.

Head, rostrum, palpi and scapal joints of the antennae, brownish-black; flagellar joints light brown, joints oval, outer joints more elongate, each joint with one or two long setae on the underside, and some of the segments with one or two short setae on the upper side. Thorax coffee brown, shining; pronotum and lateral margin paler; the median stripe of the presentum ill-defined and a trifle paler than the ground color, more so anteriorly. Scutum with pale, median vitta. Postnotum paler. Pleura pale brown with a faint sheen. Halteres pale fuscous in basal half, outer half including club, fuscous. Legs brownish-yellow, pilosity moderately long and dense; coxae yellow; femora with a pale, subapical band; tibiae and tarsi darker, claws very small, with a slender tooth near the base beneath. Wings ample, light fuscous, with pellucid, or sub-pellucid, spots or patches in all the cells, except M²; the spots predominate in the apical cells, the patches, irregular or streak-like, in cells R, M, Cu, and A¹. Sc long, ending at some distance beyond the origin of Rs; Sc¹⁺² subequal. Stigma large, oval, brown, a small, dark fuscous spot at end of Sc; Cu dark brown, seamed with fuscous; vein A¹ slightly, A² more markedly, undulated; cell 1st M² closed. Abdomen brown, tergites indistinctly paler posteriorly; venter paler near the base. Ovipositor short, sordid yellowish, dorsal valves curved upward.

Holotype.—♀; Hazleton, Pennsylvania. July 22, 1915.

Taken in company with *D. gladiator*, in a swampy location at the foot of Fisher's Hill, to the right of the highway, north of the city.

This pretty fly is unlike any other known to me. The long Sc, spotted wings and banded femora are similar to *simulans* Walker; it differs in the spots being pale on a darker ground color.

Genus **LIMNOBIA** Meigen

Limnobia Meigen, Illiger's Mag., II, p. 262, 1803.

Limnobia fallax Johnson, Proc. Boston, Soc. Nat. Hist., xxxiv, p. 125, 1909.

Rare. July 19, 1915. Two specimens, at Fisher's Hill.

Limnobia indigena Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1861, p. 215, pl. 3, fig. 3; Mon. N. A. Dipt., iv, p. 94, pl. III, fig. 7.

Infrequent. June 5, 15 and 27, 1911; October 2, 1919.

Limnobia tristigma Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 216; Mon. N. A. Dipt., iv, p. 94.

Common in open woods. July.

Limnobia triocellata Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 216; Mon. N. A. Dipt., iv, p. 92.

Not rare. August and September. I have bred this species from a *Polyporus*.

Tribe *Antochini*

Genus **RHAMPHIDIA** Meigen

Rhamphidia Meigen, Syst. Besch., vi, p. 281.

Rhamphidia flavipes Macquart, Dipt. Exot. Suppl., v, p. 17, pl. 1, fig. 1.

Rather common, in damp places; May to September.

Genus **ELEPHANTOMYIA** Osten-Sacken

Elephantomyia Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 220; Mon. N. A. Dipt., iv, 106, 1869.

Elephantomyia westwoodi Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 221; Mon. N. A. Dipt., iv, p. 109, pl. I, fig. 5 and pl. III, fig. 8.

Common in wet places with abundant vegetation; June to August.

Genus **TOXORHINA** Loew

Toxorhina Loew, Linnaea Entomol., v, p. 400.

Toxorhina mullebris Osten-Sacken, Proc. Ent. Soc. Phila., p. 233, 1865; Mon. N. A. Dipt., iv, p. 115; III, App.

Rare. June 29, 1912; July 7, 1919; July 1, 1920.

Genus **ATARBA** Osten-Sacken

Atarba Osten-Sacken, Mon. N. A. Dipt., iv, p. 127, 1869.

Atarba picticornis Osten-Sacken, Mon. N. A. Dipt., iv, p. 128, pl. I, fig. 13.

Rare. July 29, 1912; July 1, 1919; July 6, 1920. Only three specimens taken.

Genus **ANTOCHA** Osten-Sacken

Antocha Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 219; Mon. N. A. Dipt., iv, p. 125, 1869.

Antocha saxicola Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 219, (*Antocha opalisans* Osten-Sacken, syn.); Mon. N. A. Dipt., iv, p. 126, pl. I, fig. II, and pl. III, fig. 10.

Rare. A single example taken, June 26, 1909.

Tribe *Eriopterini*Genus **GONOMYIA** Meigen

Gonomyia Meigen Syst. Besch., i, p. 146.

Gonomyia manea Osten-Sacken, Mon. N. A. Dipt., iv, p. 178, 1869.
St. Johns. June 21, 1918, six specimens; the only record.

Gonomyia sulphurella Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 230; Mon. N. A. Dipt., iv, p. 180, pl. II, fig. 2.

Not common. June and September.

Gonomyia subcinerea Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 231; Mon. N. A. Dipt., iv, p. 181, pl. II, fig. 2.

Scarce. May 29, 1912; July 18, 1910; July 27, 1915; July 20, 1920; September 2, 1915; September 12, 1917.

Genus **EMPEDA** Osten-Sacken

Empeda Osten-Sacken, Mon. N. A. Dipt., iv, p. 183, 1869.

Empeda stigmatica Osten-Sacken, Mon. N. A. Dipt., iv, p. 184, 1869.
Common locally. May to September.

Genus **HELOBIA** St. Fargeau and Serville

Helobia St. Fargeau and Serville, Encyclop. Method., Ins., x, p. 585.

Helobia hybrida Meigen, Klussif., p. 57, 1804; System. Besch., i, p. 147, (*Lamnobla*); vi, p. 283, (*Symplecta*).

Generally distributed. At times common; from April to late Fall.

Genus **GNOPHOMYIA** Osten-Sacken

Gnophomyia Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 223; Mon. N. A. Dipt., iv, p. 172, 1869.

Gnophomyia tristissima Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 224; Mon. N. A. Dipt., iv, p. 174.

Rare. May 29, 1916; July 19, 1911.

Genus **ERIOPTERA** Meigen

Erioptera Meigen, Illiger's Mag., ii, p. 262.

Subgenus **Erioptera** Meigen

Erioptera septentrionis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 226; Mon. N. A. Dipt., iv, p. 155.

Very common. Occurs from early Spring until late Fall; often seen in swarms in September.

Erioptera chrysocoma Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 226; Mon. N. A. Dipt., iv, p. 155.

Rather common some seasons, rare others. June, July and August. Common in 1910 to 1912 and again in July, 1920.

Erioptera vespertina Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 226, pl. i, fig. 19; Mon. N. A. Dipt., iv, p. 157, pl. iv, fig. 20.

Not common. June 19, 1912; June 21, 1919; July 18, 1910.

Erioptera chlorophylla Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 226; Mon. N. A. Dipt., iv, p. 157, pl. i, fig. 7.

Rare. July 6, 1920, August 29, 1919.

Erioptera holoptica spec. nov.

Near *megalophthalma* Alexander. Eyes large, narrowly separated above, broadly continuous beneath. Thoracic stripes well-marked; scutum, scutellum and postnotum spotted with reddish-brown.

Male, length, 3.5 mm.; wing, 4.2 mm.

Rostrum and mouthparts brownish; the narrow space between the eyes projects as a yellow, elevated ridge. Antennae rather short; scapal joints large, the first dark brown, the second paler; three to four basal joints of flagellum pale yellow, rapidly diminishing in thickness, outer joints very slender, light fuscous. Thorax pale yellow, prescutal stripes reddish-brown, very broad, leaving a very narrow interspace of the ground-color; the lateral stripes of the prescutum are broadly continued upon the scutum, leaving a narrow line of the ground color each side of the median life; a median stripe of scutellum and postnotum, and posterior border of scutellum, yellowish-

brown. Pleura light brownish-yellow, with a slight sheen. Halteres sulphur-yellow, rather short, club large. Legs pale sulphur-yellow, pilosity sparse, scarcely perceptible except on the tarsi, outer joints of the latter infuscate. Wings pale yellowish; veins pale, yellowish, weak; pubescence short, inconspicuous. Abdomen pale, reddish-brown, pilosity pale yellow, short and sparse. Hypopygium reddish-yellow.

Holotype.—♂; Hazleton, Pennsylvania. June 18, 1914.

Paratypes, males, topotypic, two, July and August, 1910; one, August 1912; two, July 1913; one, August 1914; one, June 1915; one, June 1916; one, August 1919; one male Palmerton, Carbon County, Pennsylvania, June 6, 1920.

Distinguished from *megalophthalma* by its smaller size, absence of silvery line along inner orbital margin, well-marked thoracic stripes and strongly marked spotted scutum, scutellum and postnotum.

A certain divergence from the type is observed in the eye, which in some specimens appears to be quite holoptic, while the inter-orbital ridge in others is nearly yellowish-brown. The color of the rostrum likewise varies from yellowish to brownish. The thoracic stripes, however, are well marked in all my specimens.

Two specimens, taken in 1920, differ sufficiently to be considered as a new variety.

***Erioptera holoptica fusco-antennata* var. nov.**

Rostrum, mouth-parts and antennae, entirely dark fuscous. Antennae a little longer and less slender. The wings rather pale grayish, instead of yellowish.

Holotype.—♂; Hazleton, Pennsylvania. May 27, 1920.

Paratype.—♂; topotypic.

It appears that *E. megalophthalma* Alexander, the above described species and variety, and *macrophthalma* Loew (Europe), form a distinct group, if not a subgenus.

Subgenus ***Acyphona*** Osten-Sacken

Mon. N. A. Dipt., iv, p. 151, pl. II, fig. 17.

Erioptera venusta Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 227, pl. IV, fig. 23; Mon. N. A. Dipt., iv, p. 157, pl. IV, fig. 20.

Rare. July 5, 1910; July 7, 1913; July 20, 1920.

Erioptera armillaris Osten-Sacken, Mon. N. A. Dipt., iv, p. 158, 1860.

Rare. July 14, 18, 23, 1910; July 29, 1912.

Subgenus **Hoplolabis** Osten-Sacken

Mon. N. A. Dipt., iv, p. 152, pl. 1, fig. 18.

Erioptera armata Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 227, pl. 1, figs. 20, 21; Mon. N. A. Dipt., iv, p. 160, pl. 1, fig. 18, and pl. iv, fig. 11.

Not rare. May to September.

Subgenus **Mesocyphona** Osten-Sacken

Mon. N. A. Dipt., iv, p. 152.

Erioptera caloptera Say, Journ. Acad. Nat. Sci. Phila., iii, p. 17; Complete Works, ii, p. 11.

Common. June to October.

Erioptera needhami Alexander, Can. Ent., i, p. 283, 1918.

A single specimen, taken July 7, 1910.

Genus **MOLOPHILUS** Curtis

Molophilus Curtis, Brit. Entomol., p. 114, 1833.

Molophilus pubipennis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 228, (*Erioptera*); Mon. N. A. Dipt., iv, p. 162.

Very common. June to September.

Molophilus fultonensis Alexander, Proc. Acad. Nat. Sci. Phila., 1916, pp. 505 to 506, pl. xxvii, fig. 37.

Common with the preceding in damp situations. June to August.

Molophilus hirtipennis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 228, (*Erioptera*); Mon. N. A. Dipt., iv, p. 163.

Very common, especially late in the season. Occurs from May to September.

Molophilus forcipula Osten-Sacken, Mon. N. A. Dipt., iv, p. 163, 1869, (*Erioptera*).

Rather scarce from May to August; very common in September among low herbage in swampy situations.

Molophilus forcipula heterocera subsp. nov.

Differs from the typical form in the pale yellow antennal flagellum; the first scapal joint brown, the second, yellowish-brown. The sulphur-yellow humeral spot is scarcely noticeable. Other differences, if any, I fail to see.

Holotype.—♂; Hazleton, Pennsylvania. September 16, 1913.

Paratype, two males, topotype, same date.

***Molophilus costopunctatus* spec. nov.**

Close to *forcipula*. Scapal and basal joints of flagellum, pale yellow. Wings with a dark fuscous costal spot.

Male, length, 2.3 mm.; wing, 4 mm.

Head reddish-brown above, palpi and rostrum dark fuscous. Antennae a little longer than the proscutum; scapal and basal joints pale yellow, outer joints light brown. Thorax light brown above. Pronotum, lateral margin of proscutum and scutum, light yellow; pseudosutural foveae dark; stripes indistinct; a fine, darker, median line in anterior half. Pleura darker brown. Halteres pale, club fuscous. Legs yellowish-brown, coxae and base of femora paler; tarsi fuscous; pubescence fine, short. Wings pale with a yellowish tint; veins pale; a small but conspicuous, blackish spot on the costal margin, midway between cross vein r and end of R; basal deflection of Cu¹ longer and nearly in a line with the basal deflection of M⁴⁺¹; pilosity pale, fine, long and inconspicuous. Abdomen brown, venter scarcely paler, with pale yellow hairs. Hypopygium reddish-brown; pleurites elongated, dorsal appendages blackish, claw-like, curved dorsad; ventral appendages similar, curved ventrad.

Holotype.—♂; Hazleton, Pennsylvania. September 16, 1913.

Easily recognized by the dark costal spot.

Genus **ORMOSIA** Rondani

Ormosia Rondani, Prodrömus, 1, p. 180.

Ormosia atriceps Dietz, Trans. Amer. Ent. Soc., XLII, p. 136, pl. x, fig. 1.

The holotype is the only specimen taken thus far. July 11, 1913.

Ormosia nubila Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 227, (*Erioptera*); Mon. N. A. Dipt., iv, p. 141, pl. I, fig. 11.

Common in swampy localities; May. A number of specimens in my collection from other localities are labeled August and September.

Ormosia arcuata Doane, Ent. News, XIX, p. 201, 1908, (*Rhypholophus*).

Common. April and May, and again in September along rivulets.

Ormosia abnormis Dietz, Trans. Amer. Ent. Soc. XLII, p. 137, pl. x, fig. 3.

No more examples have turned up since the species was de-

scribed. August 25 and 31, 1914, and August 25 and September 3, 1913.

Ormosia luteola Dietz, Trans. Amer. Ent. Soc., XLII, p. 138, pl. x, fig. 4.

The same remarks, as under the preceding species, apply here. June 11, 1913, July 1, 1913; July 25, 1914.

Ormosia pygmaea Alexander, Psyche, xix, p. 166, pl. XIII, fig. 3, 1912, (*Trimicra*); *Ormosia pilosa* Dietz, Trans. Amer. Ent. Soc., XLII, p. 139, pl. x, fig. 5.

Not rare. May to September.

Ormosia nigripila Osten-Sacken, Mon. N. A. Dipt., iv, p. 142, 1869, (*Rhypholophus*).

Rare. May and June; common in September in swamps.

Ormosia palpalis Dietz, Trans. Amer. Ent. Soc. XLII, p. 140, pl. x, fig. 6.

No additions to be reported to the holotype and single paratype; October 16, 1913; September 11, 1915.

Ormosia rubella Osten-Sacken, Mon. N. A. Dipt., iv, p. 144, pl. 1, fig. 15, (*Rhypholophus*).

Very common. September and October.

Ormosia rubella enigmatica variety(?) nov.

This female specimen, agrees in every particular with the normal form except in the head, which is prolonged into a rostrum nearly as long as the thorax, moderately curved and of nearly equal thickness, tapering towards the apex. I cannot discover any palpal structures, except two very short projections near the base above. It may prove a freak.

Holotype.—♀; Hazleton, Pennsylvania. September 19, 1918.

Ormosia deviata Dietz, Trans. Amer. Ent. Soc., XLII, p. 143, pl. x, figs. 9 and 9a.

Not rare. May and June, and again in September.

Ormosia melgenii Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 226, (*Erioptera*); Mon. N. A. Dipt., iv, p. 144, (*Rhypholophus*).

This species was very common in May 1910 and 1911, but since then no specimens have been taken.

Ormosia subcostata spec. nov.

Wings unicolorous; costa darker from density of pubescence, the stigma a trifle darker; cell 1st M² opens into cell M²; anal veins converging.

Male, length, 4 mm.; wing, 5.5 mm.

Head gray above; rostrum and mouth-parts dark brown. Antennae light brown, of moderate length, slender; covered with a long, dense, whitish pilosity, approximately as long as the segments, and giving the antennae a pale appearance. Thorax grayish-livid, with a grayish-white pruinosity; sordid yellow, median dorsal stripe, wider anteriorly, margined each side by a dark, fuscous line, the latter becoming wider posteriorly; exteriorly to these lines, is a row of short, whitish hairs and beside these are scattered, whitish hairs. Postnotum darker. Pleura reddish-brown with whitish pruinosity. Halteres sordid yellow, club paler. Legs yellow, pubescence short and fine (tarsi wanting). Wings yellowish-gray, base more yellowish; costal cells and cell 2nd R appear infuscated; the darkening being due to the density of the pubescence; stigmal region a trifle darker. Veins rather strong, brown; cell 1st M² opens into cell M¹; anal veins approach each other towards the wing margin. Pubescence long, brown and conspicuous, giving the wing a sub-fuscous appearance. Abdomen brown, covered with long, yellowish hairs. Hypopygium concolorous, pleurites large, bent ventrad and diverging; appendages small, blackish; the ninth sternite prolonged into a spatulate process.

Holotype.—♂; Hazleton, Pennsylvania. August 15, 1911.

Its nearest ally appears to be *perplexa*, from which it differs in its larger size, more slender antennae and the pale, median, thoracic stripe. The two dark lines, edging the yellow median stripe, resemble in some respect the dark thoracic lines of *bilincata*; the latter, however, is devoid of a yellow median stripe, besides other differences.

Ormosia divergens Dietz, Trans. Amer. Ent. Soc., XLII, p. 141, pl. x, fig. 10.

Rare. July 5, 1910 and July 22, 1915; June 14, 1915.

Ormosia monticola Osten-Sacken, Mon. N. A. Dipt., iv, p. 145, 1869, (*Rhyptolophus*).

Not common. June, September.

Tribe *Limnophilini*

Genus **ULA** Haliday

Ent. Mag., I, p. 153.

Ula paupera Osten-Sacken, Mon. N. A. Dipt., iv, p. 232.

Rare. May 25, 1912; September 29, 1919 and September 11, 1920. Only three specimens taken.

Ula longicornis spec. nov.

Antennae (♂) much longer than in *U. paupera* (♀), not paler at base. Thorax with sharply defined, broad, shining, brown stripes.

Male, length, 5 mm.; wing, 6.5 mm.

Head, rostrum and palpi, dark fuscous; a grayish margin along the orbits. Antennae long and slender, extended backward, they reach to about the middle of the abdomen; scapal joints short, not paler; basal flagellar segments about three times as long as thick, outer segments at least twice the length of their thickness; pubescence whitish, dense and evenly distributed; very few, but long, verticellar setae. Thorax brownish, with pale pollinosity and some luster; a sharply defined, rather broad, very shining, darker median stripe present. Pleura grayish-brown, pollinose. Halteres pale, club dark fuscous apically. Legs sordid yellow; anterior femora brown, except at base; outer half of middle femora, and apical part of posterior femora, brownish. Pubescence dense, and rather coarse. Wings grayish, unicolorous; veins brown; pubescence fine and evenly distributed. Abdomen brown, pilosity long, scattered. Hypopygium yellow, hairy; upper appendages blackish, short, claw-like.

Holotype.—♂; Hazleton, Pennsylvania. August 6, 1920.

Distinguished from *paupera*, by the unicolorous and more strongly elongated antennae.

Genus **ULOMORPHA** Osten-Sacken

Ulomorpha Osten-Sacken, Mon. N. A. Dipt., iv, p. 232.

Ulomorpha pilosella Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 211, (*Limnophila*); Mon. N. A. Dipt., iv, p. 233, 1869.

Not rare. May to September.

Genus **ADELPHOMYIA** Bergroth

Adelphomyia Bergroth, Mittheil. Naturfor. Ges. Bern., 1890, p. 131.

Adelphomyia minuta Alexander, Can. Ent., XLIII, p. 287, 1911.

Plentiful in a small, swampy locality, May 26, 1919, also, St. Johns, May 28, 1920. Not taken before.

Adelphomyia pleuralis spec. nov.

General coloration reddish-brown. Cell M¹ present, cross-vein r absent; wing pubescence distinct. Pleura with fuscous stripes.

Male, length, 2.5 mm.; wing, 3.7 mm.

Head, rostrum and mouthparts dark fuscous; occiput dark gray with white periorbital line. Antennae, with the exception of the second joint, brown, the latter blackish; verticels strongly marked, pubescence short, pale. Thorax brownish-yellow, slightly pollinose, with some luster above; antero-lateral margin paler. Pleura paler, whitish pollinose; a dark fuscous, oblique line from the pronotum across the mesosternum; another fuscous line, parallel with the former, along the base of the coxae. Halteres pale throughout. Legs yellow; femora infuscate at the apex; tarsi scarcely darker; pilosity

long and dense, especially on the tarsi. Wings semi-pellucid; pubescence rather long, and quite distinct in apical portion of wing; stigma indicated by a slight darkening of the membrane; cross-vein *r* absent; the *Sc* ends just about on a line with the basal deflection of $R^1 + ^2$; Sc^1 about five or six times the length of *Sc*²; sector long, slightly curved at its origin, and about as long as R^2 ; basal deflection of $R^1 + ^2$, a little more than one-half the length of cross-vein *r-m*, the latter is four-fifths the length of the basal deflection of Cu^1 , the latter before the middle of cell 1st M^2 . Abdomen light brown, sparsely hairy, hairs long; eighth segment nearly black. Hypopygium honey-yellow, hairy; appendages strong, claw-like, blackish.

Female, length, 3 mm.; wing, 4.5 mm.

Abdomen light brown, the penultimate segment scarcely darker. Ovipositor yellowish, curved upwards, the apical half of the valves blackish.

Holotype.—♂; Hazleton, Pennsylvania. July 6, 1920.

Allotype.—♀; topotypic, June 21, 1919.

Paratypes, five males, July 6, 1910; five males, June 28, 1920; one female, July 6, 1920. All topotypic.

This species resembles *A. americana* in its general coloration. The fuscous pleural stripes distinguish it from the three heretofore described American species. In some specimens cross-vein *r* is faintly indicated, and I find this also in some examples of *minuta*. The almost black, second antennal joint and penultimate abdominal segment of the male, are quite constant. The pedicle of cell M^1 varies from three to four times the length of the cell.

***Adelphomyia hazletonensis* spec. nov.**

Near *cayuga*. Cell M^1 absent; cross-vein *r* distinct.

Male, length, 3 mm.; wing, 4.3 mm.

General coloration yellowish-brown. Head grayish-brown above; rostrum, palpi and antennae dark brown, five to six basal joints incrassate, the flagellar joints one to three or four somewhat fused together, remainder of flagellum slender, joints elongate; hairs of the verticils very long, pubescence very fine. Thorax brown, shining; stripes obsolete; anterior half of pleura brown, posterior half yellowish-gray. Basal half of pedicle of halteres white, outer half light brown, club dark brown. Legs dusky yellow; pilosity long, dense, brown, giving the legs a fuscous color; tarsi fuscous; tibiae nearly twice the length of the metatarsi, apical spurs very minute. Wings pale gray; veins brown, *M* weak; cross-vein *r* distinct, Sc^1 long, nearly equal to $R^2 + ^3$, cell M^1 wanting; veins Cu^2 , A^1 and A^2 strongly incurved to the wing-margin; pubescence very sparse and confined to the apex of the wing, scattered long hairs over the wing surface; veins with setigerous punctures. Abdomen brown, somewhat paler beneath, with scattered hairs. Hypopygium brown, pleurites elongate, densely hairy.

Holotype.—♂; Hazleton, Pennsylvania. September 1, 1920.

Paratype.—♂, topotype and taken same day.

The two specimens were taken in a very wet, swampy place.

The neururation agrees exactly with that given by Alexander of his *A. cayuga*²; there, cross-vein r is represented as present. This figure differs from that accompanying the original description,³ where vein r is absent. Comparing the above type with a specimen of *cayuga*—minus abdomen—kindly given me by Dr. Alexander, *hazletonensis* is darker, the pleura anteriorly conspicuously dark brown, and paler posteriorly; the wings a trifle narrower, clearer pale gray and not yellowish near the base; the pubescence much more scanty and scarcely noticeable. I fail to see any long scattered hairs on the wing of *cayuga*, and the latter is a decidedly larger insect.

Genus **EPIPHRAGMA** Osten-Sacken

Epiphragma Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 238; Mon. N. A. Dipt., iv, p. 193.

Epiphragma fascipennis Say, Journ. Acad. Nat. Sci. Phila., iii, p. 19; Compl. Works, ii, p. 45, (*Limnobia*).

Common. May and June; in open woodlands on sandy soil near water; wet meadows.

Genus **LIMNOPHILA** Macquart

Limnophila Macquart, Suite à Buffon, Hist. Nat. Ins. Dipt., p. 95, 1834.

Subgenus **Dicranophragma** Osten-Sacken

Dicranophragma Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 240; Mon. N. A. Dipt., iv, p. 199.

Limnophila fuscovaria Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 240; Mon. N. A. Dipt., iv, p. 225.

Very common. May to August in moist places.

Subgenus **Ephelia** Schiner

Ephelia Schiner, Wiener Entom. Monatschrift., vii, p. 222, 1836; Schiner, Fauna Austriaca, ii, p. 549.

² The Craneflies of New York, Part I, pl. xii, fig. 162.

³ Pomona Journ., iv, p. 830, 1912.

Limnophila aprilina Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 235; Mon. N. A. Dipt., iv, p. 223, pl. iv, fig. 23.

Not rare. June, July and August.

Subgenus ***Lasiomastix*** Osten-Sacken

Lasiomastix Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 233; Mon. N. A. Dipt., iv, p. 199.

Limnophila macrocera Say, Journ. Acad. Nat. Sci. Phila., iii, p. 20, 1823 Compl. Works, ii, p. 46. (*Limnobia*).

Not rare. Swampy localities, June, July and August.

Limnophila tenuicornis Osten-Sacken, Mon. N. A. Dipt., iv, p. 208, 1869.

Rare. My material was taken in June and July, from 1912 to 1916, none since.

Subgenus ***Prionolabis*** Osten-Sacken

Prionolabis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 239; Mon. N. A. Dipt., iv, p. 197, pl. ii, fig. 3 and pl. iv, fig. 27.

Limnophila rufibasis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 239; Mon. N. A. Dipt., iv, p. 225, pl. ii, fig. 3 and pl. iv, fig. 27.

Not rare. June and July in open woodlands; occasionally as early as April.

Limnophila mundoides Alexander, Journ. N. Y. Ent. Soc., xxiv, p. 120, pl. 8, fig. 3, 1916.

This species was of frequent occurrence in May and June, 1919. Not taken before or since.

Subgenus ***Pseudolimnophila***

Pseudolimnophila Alexander, The Crane-flies of New York, part 1, p. 917, 1919.

Limnophila luteipennis Osten-Sacken, Proc. Acad. Nat. Sci. Phila., p. 236; Mon. N. A. Dipt., iv, p. 217, pl. ii, fig. 10 and pl. iv, fig. 25.

Quite common. June to August, in open woods.

Limnophila nigroleura Alexander and Leonard, Proc. Acad. Nat. Sci. Phila., 1914, p. 592, pl. xxv, fig. 3.

Very common. June, July.

Limnophila inornata Osten-Sacken, Mon. N. A. Dipt., iv, p. 219, 1869.

Rare. June 5, 9, and 19, 1912; June 30, 1913.

Limnophila contempta Osten-Sacken, Mon. N. A. Dipt., iv, p. 218, 1869.
Not rare. May to August.

Subgenus ***Eulimnophila*** Alexander

Eulimnophila Alexander, The Craneflies of New York, part 1, p. 917, 1916.

Limnophila tenuipes Say, Journ. Acad. Nat. Sci. Phila., iii, p. 21, 1823;
(Ompl. Works, ii, p. 46, (*Limnobia*).
Common. June to August.

Limnophila imbecilla Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859,
p. 237; Mon. N. A. Dipt., iv, p. 213.
A single female taken June 21, 1919.

Limnophila recondita Osten-Sacken, Mon. N. A. Dipt., iv, p. 212, 1869.
Very common in June and July some years ago; rather scarce
of late.

Subgenus ***Phylidorea*** Bigot¹

Limnophila adusta Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 235;
Mon. N. A. Dipt., iv, p. 196, 1869.

Rather common from May to August, some years ago, more
rarely seen of late years.

Limnophila lutea Doane, Journ. N. Y. Ent. Soc., viii, p. 191, 1900.

Of frequent occurrence from May to July in the years 1910 to
1916. No specimens taken since.

Limnophila adjuncta Dietz, Can. Ent., lii, p. 5, 1920.

June 5, 1911; June 11, 1912; June 1, 1915; May and June,
1919.

Limnophila consimilis spec. nov.

Similar to *adjuncta* Dietz in size and coloration, especially of the legs.
Costal cells not infuscated.

Male, length, 8.4 mm.; wings, 8.2 mm.

Head dark fuscous, the ground color concealed under a dense, gray pollinosity on the vertex, less marked on front and rostrum. Antennae of moderate length, scapular joints dark brown, the first finely pruinose, elongate; the second short, cyathiform; flagellum yellowish-brown, the hairs of the verticils irregular, weak; pubescence whitish, long but not dense; joints elongated, the basal three joints somewhat thickened. Thorax yellowish. Pronotum reddish-brown in middle portion, extending upon the neck; lateral portion of pronotal scutum reddish-brown; prescutal stripes distinct, dark reddish-

¹ Introduced here on the authority of Dr. Alexander, The Craneflies of New York, part 1, pp. 918 and 919.

brown, highly polished and narrowly separated by fine lines of the ground-color; scutum reddish-brown, paler latero-posteriorly. Scutellum yellowish-brown, with scattered, pale hairs; postnotum yellowish-brown, paler laterally. Pleura brownish-yellow, shining. Halteres pale, pedicle finely pubescent, club infusate. Legs brown, coxae, basal fourth of anterior femora, basal third of middle femora and basal half of posterior femora, yellowish; tibiae pale brown, darkened at the apex, tarsi fuscous; pilosity blackish, dense and appressed. Wings pale yellowish, costal cells concolorous, stigma brown, distinct, the included part of R dark brown; apical portion, especially in costal region infusate; veins brown, M and A¹ paler; Sc¹ and ² approximately equal; Rs short, subangulate near base and about one half longer than R²⁺³; pedicle of cell M¹ a little longer than this cell. Abdomen sordid yellow, darker posteriorly, with rather long, scattered, pale hairs. Hypopygium ferruginous, hairy; appendages short, blackish.

Female, length, 10 mm.; wing, 9.5 mm.

Differs from the male in its larger size, the less defined and paler thoracic stripes. The abdomen entirely light brown. Ovipositor ferruginous, valves very slender, curved. The antennae differ scarcely from those of the male.

Holotype.—♂; Hazleton, Pennsylvania. June 28, 1912.

Allotype.—♀; topotypic, June 24, 1912.

Paratypes, males, topotypic, one, June 13, 1919; one, July, 1920; Palmerton, Carbon County, Pennsylvania, July 1, 1919; Black Mountains, North Carolina, June 1912, (W. Beutenmueller); females, topotypic, one, July 20, 1920; one, August 1, 1910; Palmerton, Carbon County, Pennsylvania, June 9, 1918; East River, Connecticut, June 1911, (Ely); Black Mountains, North Carolina, June 1912, (W. Beutenmueller).

Varies somewhat in distinctness of the thoracic stripes. The concolorous costal cells and somewhat larger size distinguish it from *adjuncta*.

Limnophila novae-angliae Alexander, Proc. Acad. Nat. Sci. Phila., 1914, p. 504, pl. xxv, fig. 4.

Rare. June 19, 1911; July 3, 8 and 12, 1912. Not found since, although the same swampy ground has been collected over yearly.

Subgenus ***Limnophila*** Macquart

Limnophila ultima Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 238, pl. iv, fig. 26; Mon. N. A. Dipt., iv, p. 222, pl. iv, fig. 24.

Not rare in September, from 1910 to 1915; not observed since.

Limnophila areolata Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 237; Mon. N. A. Dipt., iv, p. 214.

Not rare. June and July; swamps.

Limnophila brevifurca Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 237; Mon. N. A. Dipt., iv, p. 221.

Rare. May 15, 1911, the only record.

Limnophila fratria Osten-Sacken, Mon. N. A. Dipt., iv, p. 220.

Rare. June 4, 1917; a single male.

Limnophila subcostata Alexander, Can. Ent., XLIII, p. 288, 1911, (*Phylidorea*).

Rare. May 27, 1912; a single male.

Limnophila toxoneura Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 236; Mon. N. A. Dipt., iv, p. 213.

Not rare. June and July.

Limnophila noveboracensis Alexander, Psyche, XVIII, p. 196, pl. 16, fig. 3, 1911. This species should have been recorded under the subgenus *Pseudolimnophila*.

Rare. July 22, 1915; July 5, 1917.

Limnophila quadrata Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 241; Mon. N. A. Dipt., iv, p. 230, pl. II, fig. 9.

Common. Occurs the whole season; most frequently in May and June.

Limnophila lenta Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 241; Mon. N. A. Dipt., iv, p. 231.

Very common. June to August, in swampy situations.

Limnophila congenita spec. nov.

Agrees with *L. lenta* in size and venation. They are distinguished as follows:

<i>lenta</i>	<i>congenita</i>
Antennae light yellowish brown.	Antennae brown.
The ninth tergite scarcely projecting in the middle.	Ninth tergite emarginate on each side, acutely projecting in the middle.
Pleurites clongate, straight, longer, diverging.	Pleurites compact, bent intrad apically.
Penis guard bilobed at base.	Penis guard not bilobed.

Holotype.—♂; Hazleton, Pennsylvania. July 27, 1915.

Allotype.—♀; topotypic, June 17, 1911.

Paratypes, topotypic, eight males, June 19, 1912; one, June 5, 1912; one, June 13, 1919; two, June 22, 1919, and one, June 21, 1920.

Tribe *Hexatomini*

During the ten years devoted to the collecting of crane-flies, I have failed to take a single representation of this tribe.

Tribe *Pediciini*Genus **PEDICIA** Latreille

Pedicia Latreille, Gen. Crust. et Ins., iv, p. 255, 1809.

Pedicia albivitta Walker, List Dipt., Brit. Mus., i, p. 37, 1848.

Rare; only four specimen taken in September, one each in 1911, 1913, 1917 and 1919.

Genus **TRICYPHONA** Zetterstedt

Tricyphona Zetterstedt, Ins. Lapponica, Dipt., p. 851, 1838.

Tricyphona inconstans Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 247; Mon. N. A. Dipt., iv, p. 266, pl. ii, fig. 15 and pl. iv, fig. 30.

Our commonest crane-fly; May to September.

Tricyphona calcar Osten-Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 247, (*Amalopsis*); Mon. N. A. Dipt., iv, p. 268, pl. ii, fig. 14.

Rare; in a swampy locality; May 27, 1920. (One male.

Tricyphona autumnalis Alexander, Can. Ent., xii, p. 30.

Not rare in swampy localities; August, September.

Genus **DICRANOTA** Zetterstedt

Dicranota Zetterstedt, Ins. Lapponica, Dipt., p. 851, 1838.

Dicranota eucera Osten-Sacken, Mon. N. A. Dipt., iv, p. 281, 1869.

Very rare. June 16, 1915; July 25, 1914.

Genus **RHAPHIDOLABIS** Osten-Sacken

Rhaphidolabis Osten-Sacken, Mon. N. A. Dipt., iv, p. 284, 1869.

Subgenus **Rhaphidolabina** Alexander

Rhaphidolabina Alexander, Proc. Acad. Nat. Sci. Phila., 1916, p. 541.

Rhaphidolabis flaveola Osten-Sacken, Mon. N. A. Dipt., iv, p. 288, 1869.

Rare. June, 1912 and 1913; June 12, 1916; September 21, 1910.

Subgenus **Rhaphidolabis** Osten-Sacken

Rhaphidolabis Osten-Sacken, Monogr. N. A. Dipt., iv, p. 284.

Rhaphidolabis tenuipes Osten-Sacken, Mon. N. A. Dipt., iv, p. 287, 1869.

Infrequent in June and July, common in September, up to 1917. Not taken since.

Subfamily CYLINDROTOMINÆ

Genus **LIOGMA** Osten-Sacken

Liogma Osten-Sacken, Mon. N. A. Dipt., p. 298, 1869.

Liogma nodicornis Osten-Sacken, Proc. Ent. Soc. Phila., iv, p. 239; Mon. N. A. Dipt., iv, p. 301.

Rather rare. May 28, 1909; June 11, 1909; June 26, 1910; June 22, 1912; June 5, 1919.

Genus **PHALACROCERA** Shiner

Phalacrocera Shiner, Wien. Ent. Monatschr., vii, p. 224, 1863.

Phalacrocera tipulina Osten-Sacken, Proc. Ent. Soc. Phila., iv, p. 241, 1865; Mon. N. A. Dipt., iv, p. 308, 1869.

Common in a small, wet area, from the fourth to twenty-sixth of May, 1919.

Phalacrocera neoxena Alexander, Proc. Acad. Nat. Sci. Phila., 1914, p. 603, pl. xxv, fig. 10.

One female taken June 30, 1913.

Subfamily TIPULINÆ

Tribe *Dolichopezini*Genus **DOLICHOPEZA** Curtis

Dolichopeza Curtis, Brit. Ent., p. 62.

Dolichopeza americana Needham, N. Y. State Mus. Bull., 124, p. 211, pl. xvi, fig. 5, 1908.

Only two examples taken; June 4, 1912, and June 13, 1919.

Genus **OROPEZA** Needham

Oropeza Needham, N. Y. State Mus. Bull., 124, p. 211, 1908.

Oropeza albipes Johnson, Proc. Boston Soc. Nat. Hist., xxxiv, p. 121, pl. xv, fig. 12, 1909.

Common. June and July, in damp open woods.

Oropeza subalbipes Johnson, Proc. Boston Soc. Nat. Hist., xxxiv, p. 121, pl. xv, fig. 5 and 11, 1909.

Took a number of specimens in a swampy region, in June 1912, a few more were taken in June 1913, 1914 and 1915. Not seen since last record.

Tribe *Tipulini*

Genus **PACHYRHINA** Macquart

Pachyrhina Macquart, Hist. Nat. Dipt., i, p. 88, 1834

Pachyrhina nobilis Loew, Cent., iv, p. 24.

Not rare in a small, swampy area; in June.

Pachyrhina virescens Loew, Berlin. Ent. Zeitschr., viii, p. 62, 1864; Cent. v, p. 25.

A single specimen, taken July 27, 1915.

Pachyrhina pedunculata Loew, Berlin, Ent. Zeitschr., vii, p. 293, 1863; Cent., iv, p. 33.

Rare. July 3, 1912; July 1, 1920.

Pachyrhina incurva Loew, Berlin Ent. Zeitschr., vii, p. 293, 1863; Cent., iv, p. 32.

Occurs frequently; May to August.

Pachyrhina macrocera Say, Journ. Acad. Nat. Sci. Phila., iii, p. 24, 1823; Compl. Works, ii, p. 48, (*Tipula*).

Very rare. June 11, 1912; July 19, 1916.

Pachyrhina macrocera var. **atrocera** Dietz, Trans. Am. Ent. Soc., xlix, p. 118, 1918.

The holotype was taken at St. Johns, July 5, 1917; a second specimen secured at Hazleton, June 29, 1920.

Pachyrhina macrocera virgata subsp. nov.

Differs from the typical form in the posterior margin of the abdominal segments and the lateral margin of the tergum being conspicuously margined with black.

Holotype. — ♀; Palmerton, Carbon County, Pennsylvania. August 3, 1916.

Paratypes, females, topotypic, one, August 4, 1916; Hazleton, Pennsylvania, July 9, 1912, July 21, 1918, July 30, 1920, August 6, 1912; Casco Bay, Maine, July 1913.

Pachyrhina hirsutula Dietz, Trans. Am. Ent. Soc., XLIV, p. 118, pl. IV, fig. 4, 1918.

The two type specimens were taken May 23, 1916. No more individuals have been secured since.

Pachyrhina tenuis Loew, Berlín. Ent. Zeitschr., VII, p. 297, 1863; Cent., IV, p. 41.

Not rare. May to September.

Pachyrhina tenuis nigroantennata subsp. nov.

Differs from the typical form in its entirely fuscous antennal flagellum. The legs are brownish yellow and the abdomen darker posteriorly. The emargination of the eighth sternite is but sparsely beset with bristles.

Holotype.—♂; Hazleton, Pennsylvania. July 6, 1920.

Pachyrhina occipitalis Loew, Berlín. Ent. Zeitschr., VIII, p. 65; Cent., VI, p. 30.

One specimen, taken July 11, 1913.

Pachyrhina ferruginea Fabricius, Syst. Antl., p. 6, (*Tipula*).

Common. May to September, though less abundant of late years.

Pachyrhina beutenmuelleri Dietz, Trans. Am. Ent. Soc., XLIV, p. 130, pl. V, fig. 14, 1918.

In the description of this species, the locality for the holotype was erroneously stated as "Black Mountains, North Carolina," whereas it should have been—Hazleton, Pennsylvania, September 4, 1911. The paratype, however, came from the Black Mountains, North Carolina, (Wm. Beutenmueller).

Pachyrhina xanthostigma Loew, Berlín. Ent. Zeitschr., VIII, p. 65, 1864 Cent., V, p. 61.

Not rare. June to September.

Pachyrhina cingulata Dietz, Trans. Am. Ent. Soc., XLIV, p. 131, pl. V, fig. 17, pl. VII, fig. 30, 1918.

Not rare in a circumscribed, marshy locality; June to August. Not taken since 1915.

Pachyrhina stigmatica Dietz, Trans. Am. Ent. Soc., XLIV, p. 137, pl. VII, fig. 34, 1918.

A single male taken July 7, 1917. The types of this species were taken at Wyalusing, Bradford County, Penna.

***Pachyrhina clandestina* spec. nov.**

In my Revision of *Pachyrhina*³ this form was tabulated in the "Synoptic Table of Species," but not mentioned in the body of the paper.

Near *brevicornis*. Joints of antennal flagellum bicolorous, yellow at base. Occiput entirely glabrous. A black spot before the lateral prescutal stripes. Abdomen with lateral row of oblique dashes.

Female, length, 15.5 mm.; wing, 13.5 mm.

Head and rostrum yellowish-red; mouth-parts dark fuscous. Palpi light brown, paler at base. Frontal prolongation with blackish hairs, much longer on nasus. Antennae of moderate length, scapal joints and first flagellar joint yellow, the latter darker at apex; following joints excised beneath, bicolorous, basal half yellow. Occiput shining. Thorax sulphur yellow, shining above; stripes reddish-brown, sharply defined, interspaces narrow lines, almost effaced anteriorly; a well-marked oblique, black spot before the lateral stripes. Suture not tinted black. Scutum reddish-brown; median vitta and latero-posterior portion, sulphur yellow. Scutellum and postnotum, pale yellow, slightly infuscate along the middle. Pleura concolorous, reddish spots on episterna; an oblique black dash on the lateral part of the pronotal scutellum, similar to the one on the prescutum and directly below it. Halteres obscurely yellow, club fuscous. Legs obscurely yellow, darkened by the dense, very short, blackish pilosity; femora broadly, tibiae narrowly, dark fuscous at the apex; metatarsi longer than the tibiae; tarsi infuscate. Wings grayish, with a faint yellowish tint; costal cells and stigma yellow, the latter slightly darker; stem of cell M^1 as long as the basal deflection of R^{1+2} ; Cu^1 just before the fork of M .

Holotype.—♂; Hazleton, Pennsylvania. June 24, 1920.

Distinguished from allied species with bicolorous flagellum, and the joints yellow at base, by the conspicuous black spots on the anterior part of the thorax.

The labella in this specimen present a curious modification. They are in the form of a pair of elongate, lanceolate blades. In an effort to separate them in situ, they broke off. Placed on a slide for examination they disclosed a peculiar organ, somewhat in the form of a tuning-fork, both arms of which are knob-like. enlarged at the end, the enlargement directed intrad; from the base, between these arms, a long, slender, stiletto-like rod extends a trifle beyond the arms. This structure, apparently, was underneath the labella. What its homology is, I do not know.

³ Trans. Am. Ent. Soc., XLIV, pp. 105 to 140, pls. IV to VI.

Genus **NEPHROTOMA** Meigen

Nephrotoma Meigen. Illiger's Mag., p. 262, 1803.

Nephrotoma eucera Loew, Berlin. Ent. Zeitschr., vii, p. 296, 1863; Cent., iv, p. 39.

Not rare. June to August.

Genus **TIPULA** Linnaeus

Tipula Linnaeus, Syst. Natur., ed. x, p. 585.

Subgenus **Trichotipula** Alexander

Trichotipula Alexander, Proc. Acad. Nat. Sci. Phila., 1915, p. 468.

Tipula orozezoides Johnson, Proc. Boston Soc. Nat. Hist., xxxiv, no. 5, p. 131, 1909.

Occurred frequently in May and June, years ago, in open woods. Not taken since 1915.

Subgenus **Tipula** Linnaeus

Tipula trivittata Say, Journ. Acad. Nat. Sci. Phila., iii, p. 26, 1823; Compl. Works, ii, p. 50.

Rather common. May and June, open woods, meadows.

Tipula similissima spec. nov.

Agrees with *trivittata* in wing picture. Antennal flagellum unicolorous dark fuscous. Thoracic markings and abdomen alike in both.

similissima

Color of thorax more grayish-yellow; the mesosternum more distinctly infuscate.

The emargination of the ninth tergite broadly triangular,⁶ sides with two or three denticles; lateral angles of the emargination not acute.

Outer apical appendages elongate-triangular; the lower apical appendages shorter, reaching scarcely further than to the middle of the former, bicuspidate, the upper cusp longer.

trivittata

Rather a pure gray; the darkening of the mesosternum obsolete, or much less evident.

Emargination broadly subreniform, a tooth-like projection from the middle of the emargination; lateral angles of the emargination very acute.

These appendages elongate-lanceolate; the lower apical appendages longer, reaching to the level of the ninth tergite, a spatula-like process at its base posteriorly, separated from the appendage by a U-shaped emargination.

Holotype.—♂; Hazleton, Pennsylvania. June 6, 1920.

Paratypes. males; topotypic, June 6, 1912, July 10, 1918 and

⁶ In my Synopsis of *Tipula*, etc., (Annals Ent. Soc. of America, 1913, p. 462) the reference to the ninth tergite of *trivittata* applies to the present species.

July 6, 1920. Black Mountains, North Carolina, May 1912. Peachland, Manitoba, Canada, July 14, 1912.

Specimens of both these species, taken in coitu, should be pinned, if possible, on the same pin, to determine differences, if any, between the females.

Specimens submitted to Dr. Alexander were considered distinct from *trivittata* and rather close to *angulata*. These three species, together with *entomophthanae* Alexander and *huntsmaniana* Dietz, have the joints of the flagellum bicolored; the angulate post-stigmal fascia reaches the posterior wing margin in *angulata*, not in *huntsmaniana*. *Entomophthanae* is distinguished from *trivittata* and *similissima* by the angulate fascia not reaching the posterior wing margin. The species *stylifera* has a bicolored flagellum, and is distinguished from all its allies by the long slender process of the hypopygial pleurite.

***Tipula stylifera* spec. nov.**

Trivittata group; joints of antennal flagellum bicolored. Hypopygial pleurite with a long, slender process.

Male; length, 14 mm.; wing, 18 mm.

Head yellowish-gray with dark, fronto-occipital line; frontal tubercle marked. Rostrum of moderate length, dusky-yellow; frontal prolongation grayish-yellow, pilosity very short, appressed and scarcely perceptible; nasus short, obtuse with a few hairs at the apex; mouth-parts dark fuscous; two basal joints of palpi grayish-yellow, outer joints fuscous. Antennae rather stout, three, basal joints yellow, following joints bicolored; basal enlargement marked, blackish, emarginate above the latter; verticils moderate, pubescence very short and fine. Thorax a sordid grayish-white. Pronotal scutum dark yellow, scutell pale, infusate laterally. Stripes of the prescutum grayish-fuscous, the median stripe broad anteriorly, greatly narrowed behind, with a whitish median line, expanded about the middle and narrowly margined with fuscous; lateral stripes about one-half the length of the median, irregularly margined with fuscous anteriorly; interspaces with black, setigerous punctures; pseudosutural foveae black, punctiform. Scutum fuscous, margin and median stripe yellowish-white; scutell gray, fuscous anteriorly; postnotum gray, with fuscous blotches. Pleura grayish-white, with irregular, pale fuscous blotches. Halteres dusky-yellow, club fuscous. Wings grayish-fuscous; a fuscous patch at base of cells R and M, origin of sector, stigma and peristigmal space, extending to the base of cells R¹ and R²; cross-veins and longitudinal veins more or less scarred with fuscous; hyaline spaces in cells 1st R, basal part of R and M exterior to the fuscous patch, a large space at two-thirds of M, a small spot at one-fourth of A¹, two marginal spots in cell A¹, and several less distinct, in cell A²; the post-stigmal fascia

extends to middle of cell M^1 . Legs dusky yellow; femora slightly infusate at the apex; tarsi darker. Abdomen yellow above, without median stripe; a light fuscous patch on tergite two; border of tergum whitish and more or less margined with fuscous within. Venter pale gray, somewhat dusky along the middle. Eight sternite entire. Hypopygium brown; ninth tergite transversely quadrate, apical margin slightly emarginate, angles acute, transversely impressed; ninth sternite with deep U-shaped emargination. Pleural suture complete; pleurite with a long and slender process from the posterior angle, nearly straight, directed dorsad. Outer apical appendage spatulate; the inner expanded fan-like, hatchet-shaped.

Holotype.—♂: Hazleton, Pennsylvania. June 6, 1911.

The process of the hypopygial pleurite might suggest a similarity to *macrolabis* or *macrolaboides*, in both of which, however, the process is much heavier and curved. The wing pattern, also, is very different. Its differentiation from allied forms has been considered under *similissima*.

Tipula fuliginosa Say, Journ. Acad. Nat. Sci. Phila., III, p. 18, (*Ctenoph'ora*); Compl. Works, II, p. 11. (*Tipula speciosa* Loew is the male.)

A male specimen found June 12, 1912, in a pool of water.

Tipula hermannia Alexander, Proc. Acad. Nat. Sci. Phila., 1915, p. 480, (*Tipula fasciata* Loew).

Common. June to August.

Tipula sarta Loew, Berlin. Ent. Zeitschr., VII, p. 283. 1863; Cent., IV, p. 11. Rare. June 13, 1913.

Tipula senega Alexander, Insec. Inscit. Menst., III, p. 128, 1915. (*Tipula pallida* Loew, Cent., IV, p. 16.)

Rare. June 2, 1913; June 6, 1920.

Tipula ultima Alexander, Insec. Inscit. Menst., III, p. 128, 1915. (*Tipula flavicans* Fabricius, Syst. Anth., p. 21.)

Abundant in September, on low grounds, open woods, etc. Have never observed this fly before September.

Tipula abdominalis Say, Journ. Acad. Nat. Sci. Phila., III, p. 18, 1823; Compl. Works, II, p. 45, (*Ctenophora*).

Conyngham Valley, September 2, 1915. A number of specimens taken, resting on the trunk of a small tree.

Tipula costalis Say, Journ. Acad. Nat. Sci. Phila., III, p. 23, 1823; Compl. Works, II, p. 48.

Not rare; July to September. Common among reed-grasses in dried-up swamp land.

Tipula valida Loew, Berlin. Ent. Zeitschr., vii, p. 287, 1863; Cent., iv, p. 21 (*Tipula calva* Doane, Journ. N. Y. Ent. Soc., ix, p. 111.)

Rare. June 2, 1913, on a hillside about five miles west of Hazleton; June 6, 1919.

Tipula bella Loew, Berlin. Ent. Zeitschr., vii, p. 291; Cent., iv, p. 29.

May to September; more common in the earlier months.

Tipula strepens Loew, Berlin. Ent. Zeitschr., vii, p. 291, 1863; Cent., iv, p. 27.

Plentiful in a small area of dry waste land, in June 1912. Not observed since.

Tipula eluta Loew, Berlin. Ent. Zeitschr., vii, p. 290, 1863; Cent., iv, p. 27.

Rare. July 7, 1913; September 16, 1913.

Tipula fraterna Loew, Berlin. Ent. Zeitschr., viii, p. 56; Cent., v, p. 11.

A single specimen taken July 9, 1909.

Tipula tricolor Fabricius, Ent. Syst., iv, p. 235, 1794.

Rather common in former years, June and July; more rarely seen of late.

Tipula antiopa spec. nov.

Tricolor group, near *caloptera*. Antennal flagellum bicolored. Basal fourth of cell M infusate. Ninth tergite—male—produced in the middle.

Male; length, 17.5 mm.; wing, 21.5 mm.

Head. Face and front yellowish-gray; occiput gray with dark brown fronto-occipital line. Rostrum of moderate length; mouth-parts and palpi brown; frontal prolongation obscure yellow with a whitish bloom; nasus prominent, with short, black hairs. Antennae of medium length and thickness, scapal joints light brown, the second joint a little darker, the former transversely rugulose; first flagellar joint yellow, remainder yellow, basal enlargement blackish, somewhat emarginate beneath above the enlargement; setae of verticils strong, shorter than the respective segments, pubescence pale, very delicate and short. Thorax grayish-yellow. Pronotum brownish in middle and on the sides, the scutel whitish above. Pre-sutal stripes brown, broad, margined with darker, the middle stripe slightly narrowed behind, with a black, median line. Scutum with gray and fuscous blotches, the ground color merely appearing as a narrow margin. Scutellum concolorous, a brown patch on each side. Postnotum concolorous, fuscous posteriorly. Pleura concolorous, with dense, white pollinosity, prosternum and mesosternum darker. Halteres brown, extreme base yellow, club fuscous. Legs dark yellow, coxae pollinose, pilosity short, dense, black; femora and tibiae somewhat infusate towards the apices; tibiae shorter than the metatarsi; tarsi darker. Wings pale brown, costal cells yellowish-fuscous, vein dark brown, more or less heavily scamed with fuscous; the fuscous costal stripe interrupted

in outer end of cell R and 1st R; Cell M hyaline except a scant basal fourth. a hyaline stripe along base of Cu, A¹ and A²; outer three-fifths of cell R⁵, base of cell M¹, basal half of cell- M² and M¹, basal two-thirds of cell Cu¹ and base of 1st M², subhyaline.

Abdominal tergites one to six, yellow above, seven and eight, gray, sides of tergum broadly brown, interrupted by gray or yellowish-gray anteriorly on segments three to five, which encloses a short, transverse, fuscous line; lateral margin of tergum, broadly grayish-yellow. Venter yellow. Eighth sternite short, simple. Hypopygium fuscous, sides of ninth tergite yellow, median part projecting, rounded and impressed at its base. Ninth sternite ascending, deeply incised in the middle. Pleurite large, suture distinct; outer apical appendages large, broad and slightly curved outward, the outer end sub-bilobed and margined with white; the inner apical appendages small, flattened, ascending and widened apically; the lower appendages flattened, perpendicular lobes, margined with pale, somewhat protuberant.

Female; length, 21.5 mm.; wing, 21.8 mm.

Similar to male; the dorsal abdominal stripe is narrower, extends upon the seventh tergite, and is yellowish gray in color. Ovipositor brown, shining, the valves rather short, the dorsal pair slender, the ventral pair broader and shorter, and, like the dorsal pair, nearly straight.

Holotype.—♂: Black Mountains, North Carolina. June 1912. (Wm. Beutenmueller.)

Allotype.—♀: Hazleton, Pennsylvania. June 5, 1912.

Paratypes, two males, topotypic and the same date. One female, Hazleton, Pennsylvania, June 1, 1909; and one female, same locality, June 28, 1920.

Differs from *caloptera* in its somewhat smaller size, less intense coloring, and cell M nearly entirely hyaline. It differs from *calopteroidea* Alexander in its dark brown, strongly margined prescutal stripes; from *noveboracensis* Alexander in its distinctly bicolored flagellum.

Tipula longiventris Loew, Berlin. Ent. Zeitschr., vii, p. 278, 1863; Cent., iv, p. 5.

One male; June 11, 1913.

Tipula hebes Loew, Berlin. Ent. Zeitschr., vii, p. 285, 1863; Cent., iv, p. 18.

Very common. June to August.

Tipula inclusa spec. nov.

Hebes group; close to *hebes* Loew, but general coloration darker; flagellar joints bicolorous. Hypopygium brown, three lateral appendages, all strongly chitinated.

Male; length, 13 mm.; wing, 14 mm.

Head gray above; rostrum short, brown; frontal prolongation with a heavy, gray bloom. Antennae long, slender; joints yellow, those of the flagellum

with dark brown, basal enlargement. Thorax yellowish-brown with the pattern of stripes usual in this group. Pleura obscure yellow with whitish pollinosity. Halteres brown, base pale, club dark fuscous. The wing pattern well marked, but not intense. Abdomen yellowish-brown anteriorly, darker brown posteriorly, with some luster. Hypopygium dark brown, shining; the lateral processes strongly chitinized, the upper process prolonged into an acute point; the middle processes claw-like, but short and proximad to each other; the lower process pendulous, long, broad at base, becoming rounded and reaches nearly to the base of the incisure of the eighth sternite, its apex rather obtuse. The blade-like processes are protuberant, divergent, slender, and slightly twisted, the apices hooked. The eight sternite is deeply trilobed, the middle lobe narrow, pointed and sparsely fringed.

Holotype.—♂: Wyalusing, Bradford County, Pennsylvania. August 3, 1916.

Paratype.—♂; Hazleton, Pennsylvania, July 30, 1920.

Differs from *hebes* and *latipennis* (*ottowaensis* Dietz) which also have the antennal flagellum bicolored, in the dark brown, strongly chitinized pendulous process of the hypopygium, and in the acutely pointed, upper lateral process. From *helderbergensis* Alexander, which also is a dark colored species, it differs in the bicolored flagellum.

A female taken at the same time as the paratype, though, not in coitu, has a strongly marked pleural stripe; an irregular ill-defined dorsal stripe, and broad, dark fuscous, lateral stripes of the abdomen.

Tipula iroquois Alexander, Insect. Menst., III, p. 128, 1915. (*Tipula cincta* Loew, Cent., IV, p. 24.)

Conyngham Valley; one male taken May 11, 1911.

Tipula bicornis Forbes, Sixteenth Rept. State Entom. Ill., p. 78, pl. 6, fig. 4, 1891.

Very common in open woods, meadows, moist places; June.

Tipula submaculata Loew, Berlin. Ent. Zeitschr., VII, p. 288, 1863; Cent., IV, p. 23.

One male, taken June 26, 1913.

Tipula tephrocephala Loew, Berlin. Ent. Zeitschr., VIII, p. 62, 1864; Cent., V, p. 23.

Very common. June.

THE NORTH AMERICAN SPECIES OF GYRINUS

(COLEOPTERA)

BY H. C. FALL

It would be difficult to find in collections of American Coleoptera, a group or genus in which the species are so consistently and completely muddled as they are in the genus here considered. It matters little whether the collection be large or small, whether it be that of a veteran or a novice, the difference is only one of degree of confusion, and, with few exceptions, the name labels might quite as well have been drawn from a hat, so far as accuracy of assignment is concerned. Gyrini occur everywhere in our territory, and owing to their habit of congregating in schools, especially in mid and late summer, may be, and usually are at one time or another, gathered in numbers by every collector. But the difficulties of separation and identification of material are so great as to discourage much further effort, and he soon gives them up as a hard lot. They are a hard lot; there does not seem to be much to say about them taxonomically, and what little there is in the books is of no very great assistance.

In 1868, there appeared a short paper on the "Gyrinidae of America North of Mexico" by Dr. LeConte, in which the species are briefly characterized, but not tabulated, except very broadly in groups. This paper has served as the basis for all subsequent references to the genus by American authors, who have added nothing to the characters given by LeConte. In the more recent Monograph of the Gyrinidae of the world by Dr. Regimbart, our previously described species of course find a place, and two new ones—*canadensis* and *corpulentus*—are added to those listed by LeConte. Neither of these species seems to be certainly known to American collectors, and notwithstanding the fact that Regimbart's descriptions are very carefully drawn, and evince a nice discrimination in the selection of those characters which a wide experience shows to be most useful, the lack of tables, the scattering of our species

among those of the entire world, and the handicap of a foreign language, counterbalance the gains and leave us about where we were before.

I have on several occasions, without much success, endeavored to find out something about our Gyrini by a comparison of my material with LeConte's types, but the present study dates rather definitely from an investigation begun in the summer of 1916. At the end of Dr. LeConte's paper, a footnote states that a portion of a large school of *Gyrinus* collected by Uhler in the Charles River near Cambridge, Massachusetts, contained the following six species: *limbatus*, *dichrous*, *confinis*, *fraternus*, *picipes* ? (race), *lugens*." The author goes on to remark: "I have observed however at Lake Superior that the species are generally not found intermixed." On the twenty-ninth of August, 1916, while canoeing on Lake Quannipowitt at Wakefield, Massachusetts, I encountered a large school of *Gyrinus*. A good deal of variation in size was obvious, and having in mind LeConte's note, I determined to investigate on my own account. Gyrini are not easy to capture without a net, but with some sort of dipper I managed to secure about fifty specimens, which on sorting carefully seemed separable into about six species. Seeking further possible confirmation I tried the experiment of removing the genitalia¹ for comparison. The results were gratifying in the extreme. Not only were my six supposed species sharply separable by the male genital organ, but one of the six proved to be composite, giving me a seventh species. Subsequent study showed the seven species to be as follows: *ventralis*, *confinis*, *lugens*, *dichrous*, *pernitidus*, *rockinghamensis* and *aquiris*. I have on another occasion taken *affinis* at the same place in late August, and have little doubt it was also present though none were secured.

In the late summer of 1917, Mr. C. A. Frost of Framingham, Massachusetts, while on his vacation in southwestern Maine, kindly collected for me a lot of *Gyrinus*. In most instances, Mr. Frost tells me, all specimens bearing same locality and date were

¹ I was not at this time aware that Edwards and Sharp had already used this method of analysis in their study of the British species of *Gyrinus*, and Sharp's excellent paper of 1914 has come to hand only after the practical completion of my own study.

associated in the same school. The following records illustrate the point in question.

Little Androscoggin River, Paris, Maine, August 25, 1917

<i>lugens</i> , many	<i>aeneolus</i> , 1 ♂
<i>affinis</i> , 2 or 3 examples	<i>fraternus</i> , 2 ♂
	<i>bifarius</i> , 1 ♀

Same locality, August 27, 1917

<i>affinis</i> , 7	<i>latilimbus</i> , 3 ♂, 1 ♀
<i>lugens</i> , many	<i>fraternus</i> , 1 ♂
	<i>pernitidus</i> , 2 ♂

Lake Wilson, Monmouth, Maine, September 4, 1917

<i>affinis</i> , 6 ♂, 5 ♀	<i>fraternus</i> ?, 1 ♀
<i>dichrous</i> , 1 ♂, 1 ♀	<i>ventralis</i> , 2 ♂
<i>lugens</i> , 3 ♂, 3 ♀	<i>frosti</i> , many

Lake Cochnewagin, Monmouth, Maine, September 7, 1917

<i>minutus</i> , 3 ♂	<i>lugens</i> , 8 ♂
	<i>dichrous</i> , 2 ♂, 5 ♀

In all, eleven species were obtained by Mr. Frost from August 25 to September 7, in a limited area. It will be of interest to add to these a number of records of specimens taken by Mr. J. B. Wallis, on a trip from Winnipeg nearly to Hudson Bay, in the summer of 1917.

Le Pas, Manitoba, June 30, 1917

<i>maculiventris</i> , 1 ♂, 3 ♀	<i>pectoralis</i> , 1 ♂
<i>confinis</i> , 5 ♀	<i>bifarius</i> , 2 ♂, 10 ♀
<i>minutus</i> , 1 ♂, 1 ♀	<i>wallisi</i> , 1 ♂

Piquitenay River, July 6, 1917

<i>maculiventris</i> , 5 ♂, 3 ♀	<i>pectoralis</i> , many
<i>confinis</i> , many	<i>wallisi</i> , many
<i>minutus</i> , 1 ♀	<i>impressicollis</i> , 3 ♂, 3 ♀

Mile 256, Hudson Bay Railway, July 12, 1917

<i>maculiventris</i> , 1 ♂, 1 ♀	<i>pectoralis</i> , 4 ♂
<i>minutus</i> , 5 ♂, 3 ♀	<i>wallisi</i> , 19 ♂, 40 ♀
	<i>picipes</i> , 2 ♂, 1 ♀

Kettle Rapids (most northern point reached), July 15, 1917

<i>minutus</i> , 8 ♂, 8 ♀	<i>confinis</i> , 21 ♂, 27 ♀
<i>lugens</i> , 2 ♂, 3 ♀	<i>bifarius</i> , 8 ♂, 6 ♀
<i>opacus</i> , 16 ♂, 16 ♀	

A total of ten species were taken by Mr. Wallis, only three of which (*minutus*, *lugens* and *bifarius*) occurred in the Maine catch.

It is obvious from the above that there is no aversion to association among the different species of *Gyrinus*, in fact any considerable school is more likely to be composite than not. That colonies may consist of a single species is undoubtedly true. Mr. Wallis has sent me two lots taken at Winnipeg and one at St. Norbert, Manitoba, the last named containing one hundred and eight specimens, all of which were *maculiventris*; while from Professor Bradley I have received a series of several thousand specimens taken at Silver Springs, Arkansas, which seems to contain nothing but *analis*.

Throughout the above investigation I have had recourse to the genitalic characters in sorting the material. Once the species have been separated in this way, it becomes possible to evaluate the superficial characters of form, color, sculpture, etc., and the student gradually acquires the ability to identify with considerable accuracy a large majority of the species from these characters alone. This is, however, only possible to the trained eye, and the casual student need expect only a moderate degree of success unless he checks up his conclusions by a study of the male genitalia; in fact there are a few species which I am disposed to believe can never certainly be recognized in any other way. Though it may seem somewhat of a nuisance, the process of removing the genitalia is a very simple one indeed, and with alcoholic or properly softened specimens, unless very old, may usually with very little experience be accomplished with little or no injury to the specimen. The essentials are some form of dissecting microscope—a simple lens of wide field so supported as to leave the hands free answers every purpose—a needle and a pair of forceps, preferably with fine curved points.

The chitinous parts of the male genitalia consist of two broad, flattened, truncate lateral processes called "valves" by Regimbart, and the intermediate oedeagus. Sharp and Muir designate as "lateral lobes" the so-called valves of Regimbart, and the intermediate piece is called the "median lobe," the term oedeagus being used (less accurately perhaps) for the combination. The valves are fimbriate at tip and very similar in all species, and seem to offer no tangible specific characters. The oedeagus on the other hand varies much, and its form, and width as compared with that of the lateral lobes or valves, combined with the most marked superficial features of color, form and sculpture, make it possible to tabulate the species in a fairly satisfactory manner. Females are often very difficult to place except through association with males. The chitinous portion of the female genitalia consists of two elongated plates strikingly similar to the male valves, and like the latter seem to be substantially alike in all species. Males of course may always be known by the dilated and squamose front tarsi. Among superficial characters, the color of the underbody is perhaps of the first importance, but must be used with some caution. In species having normally a pale ventral surface, the color may be much darkened by the method of preservation. An even greater degree of discretion is needed with respect to the color of the epipleura. LeConte long ago grouped the species according as the under side margin of the prothorax and the epipleura are testaceous or metallic black. It frequently happens, however, that in species having normally black pro- and epipleura, these parts are more or less obscurely testaceous in certain lights, and are sometimes so distinctly so as to be quite misleading. Both LeConte and Regimbart have laid considerable stress on the distinctness of the outer apical angle of the clytra. The character is, however, a very elusive one, and can hardly be depended on in any single instance to separate closely allied species. In a few of our species (notably *aeneolus*, *confinis* and *analis*) the entire upper surface is more or less distinctly aeneous, but in the great majority the margins only are bronzed. Occasional specimens occur that are entirely destitute of aeneous luster, and such are likely to be found in a sufficiently long series of any species.

In his paper on the British species of *Gyrinus*, Sharp says:² "The species of this genus are liable to a peculiar form of variation, the chitin of the upper surface—more especially of the elytra—becoming more or less dull instead of highly polished, and this dullness is sometimes accompanied by the development of an excessively minute and indefinite sculpture. As sculpture is of considerable importance in discriminating the species of the genus, it is desirable that the student should be prepared to recognize this adventitious roughening of the surface when he meets it." The same abnormal sculpturing has been observed in occasional examples of a considerable number of our species, and it is probable that all are subject to it.

Although many thousand examples of *Gyrinus* have been passed in review in the preparation of the present paper, less effort than usual has been made to obtain material from a wide range of correspondents. Something doubtless would have been gained by so doing; I have, however, seen representatives from most portions of our territory, and I do not anticipate that the number of new species yet to be discovered within our limits will be very great. As already indicated I am especially indebted to Mr. C. A. Frost and Mr. J. B. Wallis for large collections made in Maine, Massachusetts and Manitoba. Prof. J. C. Bradley has sent me practically the entire material in Gyrini of the Cornell University Collection, containing long series taken in the vicinity of Ithaca, and these together with contributions from Messrs. Woodruff, Notman and Davis, have enabled me to determine pretty definitely the character and extent of the Gyrinid fauna of central and eastern New York. From Prof. H. F. Wickham I have received a representative lot of the species taken by him in Iowa, and on his numerous collecting trips in the far west. I am also indebted for specimens to Messrs. A. B. Wolcott of Chicago, F. Waldo Dodge of Melrose Highlands, Massachusetts, Prof. A. P. Morse of Wellesley, Massachusetts, Chas. Dury of Cincinnati, Warren Knaus of McPherson, Kansas, Drs. Blaisdell, Van Dyke and Fenyes of California, and Prof. J. R. Malloch of Urbana, Illinois. Very especial thanks are due to Dr. Gahan and Mr. Arrow of the British Museum of Natural History for sending

² Entomologist's Monthly Magazine, June 1914, p. 130.

me for study one of Kirby's two original types of *G. ventralis*, without which it would have been impossible to identify the species. I have also received from them authoritative examples of *corpulentus* Regimbart and *picipes* Aubé.

The following descriptions will be found very short. The great general similarity of the different species makes it necessary only to select such features as are of most value for comparative purposes, and these taken in conjunction with the extremely important genitalic characters, will as a rule be amply sufficient for definite identification. A more general use of genitalic characters might have been advantageously made in the tabulation of the species, but I have refrained from doing so for obvious reasons. It is recommended, however, that in at least one male of each species these organs be dissected out for comparison with the figures on the plate and for future reference.

The measurements of length given are from the anterior margin of the head to the elytral apex. The measurements given by Le Conte and other of the older authors include the variable visible abdominal apex and are therefore somewhat in excess of these here given.

All types of new species are in the writer's collection.

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27. *lugens*

Upper surface distinctly aeneous, anal segment conspicuously rufous; form rather narrow, size smaller..... 28. *analis*

28. Tarsal claws yellowish..... 29. *opacus*

Tarsal claws piceous..... 29

29. Upper surface distinctly and rather closely micro-punctulate. 30. *wallisi*

Upper surface not appreciably micro-punctulate..... 30

30. Form moderately gibbous in profile.... 31. *frosti*

Form very thick, strongly gibbous..... 32. *gibber*

31. Sides of thorax and elytra less continuous than usual; first ventral segment shorter, the fifth longer than in other species.. 33. *impressicollis*

1. *Gyrinus minutus* Linnaeus

Small, narrow, moderately convex; above black, sides bronzed, surface throughout strongly reticulato-alutaceous and dull; beneath testaceous or brownish testaceous, the ventral segments except the apical one commonly more or less infuscate; scutellum very finely longitudinally carinate basally; mesosternum distinctly rather deeply sulcate.

Male genitalia. Color brownish apically, paler basally; middle lobe about as wide apically as the lateral lobes, narrowly rounded and minutely notched at tip.

Length, 3.5 to 4.3 mm.; width, 1.8 to 2.3 mm. Average length close to 4 mm.

A common species, occurring throughout Central and Northern Europe and in Siberia. In North America it ranges entirely across the continent from Maine to Alaska.

Specimens at hand are from Monmouth, Maine (Frost); Holderness, New Hampshire (A. P. Morse); Northern Illinois; Onaga, Kansas; Brookings and Volga, South Dakota; Le Pas, Piquitenay River, Mile 256 Hudson Bay Railway, and Kettle Rapids, Manitoba (Wallis); Edmonton, Alberta (Carr); Homer, Alaska (W. S. McAlpine).

The small size and dull surface luster instantly distinguish this well known species from all others of our fauna except the next, which see for a statement of differences. The carina of the scutellum is never very conspicuous, and consists of a very short feeble elevation close to the thoracic margin.

2. *Gyrinus rockinghamensis* LeConte

Very closely allied to *minutus*, and considered by Regimhart and others as only a varietal form of that widely dispersed species. The two seem to be always separable, however, and I am disposed to consider *rockinghamensis* distinct by the following characters.

Size slightly smaller on the average, color beneath entirely pale, meso-sternum feebly sulcate, lateral stria of elytra less close to the margin, oedeagus more obtusely rounded and less acutely notched at tip.

Length, 3.4 to 4.3 mm.; *width*, 1.75 to 2.2 mm. Although the largest and smallest individuals before me are practically identical in size with those of *minutus*, the average length for *rockinghamensis* scarcely exceeds 3.8 mm., while for *minutus* it is about 4 mm.

Type locality.—Rockingham, North Carolina.

This species appears to be confined to the Atlantic Coast region, ranging from Massachusetts to Florida. Specimens before me bear labels, Wakefield, Mass., N. J., and Billy's Island, Okefenokee Swamp, Georgia (J. C. Bradley).

3. *Gyrinus ventralis* Kirby

Of medium size and convexity, highly polished black, often with bluish reflections, sides bronzed; body beneath nearly uniformly rufous or rufo-testaceous; upper surface without noticeable alutaceous sculpture or minute punctulation, except under high power; eleventh elytral stria well up from the margin.

Male genitalia. Color rufo-testaceous like that of the ventral surface; median lobe broader at apex than the lateral lobes, the tip subtruncate with a short median process and well defined lateral angles.

Length, 4.8 to 5.9 mm.; *width*, 2.5 to 3.2 mm. The great majority of specimens lie between 5 and 5.5 mm.

Type locality.—British America, "latitude 54°."

Specimens have been seen from Maine (Monmouth); Massachusetts (Tyngsboro, Wakefield, Attleboro, Framingham, Monterey); Connecticut (Litchfield); New York (Ithaca, Riverhead, Long Island, Chaumont River); New Jersey (Lake Hopatcong); Michigan (Pontiac); Ontario (Ottawa).

This species is a common one in Massachusetts, and probably throughout the territory from New England to the Upper Lakes. Oddly enough not a single specimen was found in the extensive material collected by Mr. Wallis on his trip from Winnipeg up along the line of the Hudson Bay Railway, although this region is closest to the type locality of any from which I have received Gyrini.

Ventralis has never been recognized with certainty from Kirby's very brief description, which applies about equally well to any one of a half dozen species occurring in the Northern United States and Canada.

Through the courtesy of Messrs. Gahan and Arrow of the British Museum, one of Kirby's two original specimens has been sent me for examination. The specimen is a male, fortunately with the tip of the oedeagus visible, which enables me to fix its identity with absolute certainty. The *ventralis* of LeConte's paper (1868), and of Regimbart's Monograph is not Kirby's species, but proves now to be an undescribed form for which the name *lecontei* is proposed in the present paper.

By the form of the apex of the median lobe of the oedeagus, *ventralis* may be instantly separated from every other species in our fauna; but to determine it from superficial characters alone is difficult or impossible even to the experienced student. The following are the species occupying in part the same territory, with which it may be confused: *lecontei*, *aquiris*, *confinis*, *bifarius* and *fraternus*.

From *lecontei* and *aquiris*, *ventralis*—if not discolored—may in most cases be distinguished by its practically uniform tint of the pale under surface, the venter being almost invariably darker medially than around the margins in the two species named. *Aquiris* is also of somewhat narrower form, while *lecontei* is a rather larger and slightly more robust species. *Confinis* is slightly narrower, less convex, and with more easily detectable alutaceous sculpture, especially in the female. *Bifarius* is extremely similar to *ventralis*, but when closely compared the lateral eleventh elytral stria is slightly farther from the margin, and, as in *confinis*, the alutaceous sculpture is more evident. So far as I have observed there is no way of separating the present species from *fraternus* except by genitalic characters.

1. *Gyrinus fraternus* Couper

This species was described in 1865 by William Couper of Quebec, who says it is common in ponds near that city in June and July. There are two supposedly typical specimens from

Couper in the LeConte Collection, which the latter author briefly characterizes as a little less elongate (than *confinis*), polished black, not bronzed; punctures of elytral rows stronger and equally densely placed. In his remarks, LeConte reiterates as follows: "Of the same size as *confinis* but a little more robust and easily distinguished by the entire absence of bronzed lustre on the upper surface, even at the suture and margin."

I have carefully examined these two specimens and find them both to be females and of different species. The one bearing the name label (in LeConte's hand) is entirely black above, finely alutaceous toward the apex, without trace of bronze luster, but with the elytra at the tip slightly tinged with rufous as if immature; the specimen is, I think, not perfectly normal. The second example is entirely polished and with a very distinct narrower bronzed margin to the elytra. LeConte's characterization is evidently drawn from the first specimen, but although Couper's description neither affirms nor denies the presence of a bronzed margin, I believe that normal examples will be found to possess it, and that in this respect the second specimen will prove to be more truly representative of his species. It is quite impossible with available data and material to determine just what Couper's species is. He evidently mixed at least two species, possibly more. The first of the two LeConte specimens has the lateral elytral stria more closely marginal and the ventral surface slightly darker medially: it is likely therefore to be an abnormal *aquiris* or *lecontei*. The second LeConte specimen has the lateral elytral stria more remote from the margin and may therefore be *ventralis*, or it may be an example of a very closely allied species which I have provisionally separated from *ventralis* because of a small difference in the male genitalia; the tip of the middle lobe of the oedeagus having the lateral angles rounded instead of distinct as in the true *ventralis* (see figs. 3 and 4 of plate). This form is as likely as any other to be the thing described by Couper and rather than relegate *fraternus* to the limbo of unidentified species I have chosen to use the name for this close ally of *ventralis*. There appear to be no characters other than the genitalic one by which these two species—if such they are—may be separated.

As thus identified *fraternus* is known to me from Paris and Monmouth, Maine (Frost); Hooksett, New Hampshire; Attleboro, Massachusetts, and Riverhead, Long Island, New York (W. T. Davis).

5. ***Gyrinus aeneolus* LeConte**

Rather narrowly oval, not very convex, typically with the entire upper surface distinctly bronzed, often, however, with the disk feebly bronzed, becoming more evidently so toward the margins; surface polished and without trace of alutaceous sculpture in either sex; lateral rows of punctures slightly larger than the sutural, eleventh stria distant from the margin. Beneath nearly uniformly rufo-testaceous.

Male genitalia. Pale rufous or flavo-testaceous, median lobe parallel sided in about apical fifth, and about one-third as wide as the lateral lobes.

Length, 4.1 to 5.1 mm.; *width*, 2.15 to 2.7 mm.

Both the upper and lower extremes are represented in a small series from Montreal, Canada. The majority of specimens are near the 4.5 mm. mark.

Type locality.—"Illinois."

There are in the series before me four examples from "C. Ill." kindly donated by Prof. Malloch of the Illinois State University, which must be from somewhere near the type locality. A single female specimen from Dubois County, Indiana (Blatchley), I have compared with the LeConte type and find it to be practically identical.

Other localities represented are "Penn"; New York (Ithaca, Esopus, Pine Island and Windsor); Maine (Paris); Canada (Montreal).

This species may be rather easily confused with *woodruffi*, but the less convex form and more distinct aeneous luster may serve to separate it. It should be said, however, that the eastern examples of *aeneolus* seem to be less evidently bronzed than the western ones. The genitalia are of the same type, but the middle lobe is perceptibly narrower in *aeneolus*.

6. ***Gyrinus woodruffi* new species**

Of the same size and closely similar in general appearance to the preceding species, but evidently more convex as viewed in profile and with the upper surface less distinctly to scarcely aeneous. The resemblance to *latilimbus* is also strong, but from this *woodruffi* may be distinguished by the anterior submarginal line of punctures at the sides of the pronotum being closer to the margin, by the more narrowly reflexed side margins of the thorax and elytra, and by the eleventh elytral stria being very plainly more remote from the margin. The sides of the elytra are rather broadly bronzed but less widely so than in *latilimbus*, and much less conspicuously so as a rule.

Male genitalia. Entirely rufo-testaceous in color, the middle lobe parallel in about its apical third, feebly convex dorsally, about half as wide as the lateral lobes, the apex circularly rounded.

Length, 4.15 to 5 mm.; *width*, 2.15 to 2.75 mm.

Type locality.—Staten Island, New York. Type in the author's collection.

The type (σ) is one of a series sent me by Mr. Lewis B. Woodruff, who took them from Willow Brook, June 14, 1919. With them I place two males from Philadelphia Neck, Pennsylvania, and a single male from Florida, which have identical male genitalia and are doubtless conspecific. In the type series all specimens are very symmetrically convex in profile, the highest point of the arch being at the middle of the length. This is also true of the single Florida specimen, but in the Philadelphia ones the profile is slightly gibbous, the highest point of the arch being a little in advance of the middle. In the females the surface luster is slightly dimmed by a very fine alutaceous sculpture as in *latilimbus*, and the outer elytral striae are just visibly impressed. I have not noticed this latter character in any of the males, nor in either sex of *latilimbus*.

7. *Gyrinus marginellus* new species

Form rather narrow and strongly convex; black, sides not at all bronzed in the few specimens known; surface highly polished, not visibly alutaceous or micro-punctulate in either sex; side margins of thorax and elytra very narrow; striae punctures moderate, slightly stronger in the lateral rows; eleventh stria distant from the margin; body beneath nearly uniformly rufo-ferruginous.

Male genitalia. Rufo-testaceous, middle lobe broad, distinctly wider than the lateral lobes, just visibly widened apically, tip broadly rounded, upper surface carinate, the carina becoming obsolete at tip, which is flattened.

Length, 3.9 to 4.4 mm., *width*, 2 to 2.35 mm.

Type locality.—Lakehurst, New Jersey (σ). Type in the author's collection.

Described from three examples, one pair (σ , φ) collected and kindly given me by Mr. W. T. Davis; a second male bears label "Atco N. J. Kemp."

As indicated in the description the three examples of the type series are highly polished, black, without trace of aeneous luster either at suture or margins. It is, however, very doubtful if this will prove constant in a longer series. *Marginellus* is superficially more or less closely similar to four other species

of like size, viz—*latilimbus*, *dichrous*, *aeneolus* and *woodruffi*. Of these, *latilimbus* may always be at once distinguished by the transverse row of punctures at the side of the thorax bending more strongly away from the front margin, and by the more widely reflexed side margins of the thorax and elytra. Both *latilimbus* and *dichrous* have the eleventh stria evidently nearer the margin than in the other three species, and *dichrous* differs further in the darker colored ventral segments. *Aeneolus* and *woodruffi* agree nearly with *marginellus* in the very narrowly reflexed side margins of thorax and elytra, and in having the eleventh stria more distant from the margin. In *aeneolus* the entire upper surface is more or less distinctly bronzed. In *woodruffi* there is a faint aeneous luster in some examples at least, and in the female the surface gloss is slightly dimmed by a very fine alutaceous sculpture, not detectable in *marginellus*. These two species, however, may prove difficult to distinguish without reference to genitalic characters.

8. *Gyrinus dichrous* LeConte

Our smallest species with non-carinate scutellum, averaging but little over 4 mm. in length. Above black, sides narrowly and obscurely bronzed, surface moderately shining, less highly polished than in many species but without definable alutaceous sculpture. Punctures of outer rows only slightly larger than those near the suture; eleventh stria rather close to the margin. Beneath rufous, with the ventral surface except the apical segment, dark brown or castaneous.

Male genitalia.—Rufo-testaceous, middle lobe slender and parallel-sided in apical half, scarcely one-third as wide as the lateral lobes.

Length, 3.9 to 4.4 mm; *width*, 2.2 to 2.45 mm.

Type locality.—"New England."

My specimens are from Maine (Monmouth—Frost); Massachusetts (Tyngsboro; Wakefield); New York (Chaumont River—Notman); Canada (Ottawa—Beaulne).

The small size, deep black not very highly polished surface, rufous under body with darker ventral segments, except the terminal one, make this an easily recognizable species. LeConte speaks in one place of this species as being "scarcely bronzed," and in another as "not bronzed on the margin and suture," which I believe to be the case with the type; but with clean specimens and the proper view point the margin will be

found in the great majority of specimens to be as stated above. In all species with margins normally bronzed, individuals occur in which there is no trace of metallic luster.

G. fratellus Notman, of which I owe a paratype to the kindness of the describer, is unquestionably identical with *dichrous*.

9. *Gyrinus latilimbus* new species

Size small; black, highly polished, without trace of alutaceous sculpture in the male, very finely alutaceous in the female; sides broadly bronzed in both sexes. Strial punctures of the elytra distinctly coarser laterally, eleventh stria quite near the margin. Anterior impressed line of punctures of the pronotum curving more strongly away from the front margin than in any other related species. Body beneath uniformly rufo-testaceous.

Male genitalia.—Entirely testaceous, median lobe a little narrower apically than the lateral lobes, the tip distinctly angulate.

Length, 4.2 to 4.7 mm; width, 2.2 to 2.6 mm.

Type locality.—Tyngsboro, Massachusetts. Type (♂) in the author's collection.

The localities represented before me are—Maine (Paris - Frost): New Hampshire (Farmington; Lake of the Clouds, Mt. Washington—Blanchard): Massachusetts (Tyngsboro; Monterey—Frost): Connecticut (Litchfield—Woodruff): New York (Ithaca—Cornell Univ. Coll.): Ontario (Searchmont): British Columbia (J. H. Keen).

This is the species that LeConte assumed to be the *limbatus* of Say, although he admits not having seen any examples from Georgia or Florida, the localities from which Say's types came. The present species is strictly a northern one, and is extremely unlikely to be the true *limbatus*, though what the latter can be is still a mystery. According to Say, *limbatus* closely resembles *analis* but is rufous beneath and the size a little larger. The present species is smaller than *analis* . Superficially, *latilimbus* resembles more or less strongly a number of others, notably *woodruffi* and *aeneolus* , in both of which the eleventh elytral stria is distinctly more distant from the margin, while the transverse series of pronotal punctures is in the present species more distant from the front margin than in the related species. The bronzed margin of the elytra is wider than usual in *latilimbus* , involving the four, or often five, lateral interspaces.

10. *Gyrinus bifarius* new species

Moderately elongate and of average convexity; black, polished, sides widely bronzed, sometimes distinctly, sometimes rather obscurely so. With a strong lens the elytra are seen to be very finely alutaceous and numerous minutely punctulate over the entire surface, a little more noticeably so in the female. The punctures of the outer elytral striae are but little larger than those toward the suture, the eleventh stria well above the margin, nearly as distant therefrom as in *acmolus* and *woodruffi*. Body beneath nearly uniformly rufo-testaceous or ferruginous.

Male genitalia. Rufo-testaceous, middle lobe constricted in a peculiar manner at its apical third, so as to present the appearance of an elongate superiorly flattened appendix, which is about one-third as wide as the lateral lobes, broadly concave in a longitudinal sense, acuminate at base, and narrowly rounded at tip.

Length, 4.2 to 6.5 mm.; width, 2.35 to 3.6 mm. The extremes are both very exceptional, the great majority of specimens lying between 5 and 6 mm. in length.

Type locality.—Paris, Maine. Type in the author's collection.

The type is a male bearing date 8-29-17 and is one of a miscellaneous lot, including some four or five species, taken by Mr. Frost from the Little Androscoggin River at that place. The following localities are represented in my series—Quebec (St. Denis—Ouillet): Maine (Paris): New York (Ithaca; Waterville—Notman): Michigan (Manistique River, Schoolcraft County, and Huron Mountain Club, Lake Superior—A. W. Andrews): South Dakota (Brookings): Colorado (Glenwood Springs—Fenyès): Manitoba (Le Pas and Kettle Rapids—Wallis): Oregon ("Or": The Dalles—Wickham): Nevada: California (Bishop—Fenyès; Lassen County—Nunemacher; Eldorado County; Mokelumne Hill—Blaisdell; Sacramento; Guerneville, Sonoma County—Blaisdell; Athlone, Merced County—Alonzo Davis; Pajaro—Wickham; Bakersfield—J. O. Martin; Riverside).

This is one of our most widely dispersed species, ranging from Maine to California, common enough in collections without doubt, but mixed with one or another of several species which it more or less closely resembles. There is no great difficulty in separating it from any of its closer allies except *confinis*, if one uses a lens strong enough to show up the fine alutaceous sculpture and minute punctulation of the elytra, which

is characteristic of normal examples of these two species. *Confinis* is a somewhat larger species on the average, and the eleventh elytral stria is a little nearer the margin than in *bifarius*. These differences are, however, not reliable in all individuals, and the only sure test is the genitalic one.

In a species so widely dispersed as *bifarius*, a considerable amount of variation should be expected; this is especially noticeable in the size, form, luster and distinctness of the fine ground sculpture.

11. *Gyrinus confinis* LeConte

A little larger, slightly narrower and a little less convex than *ventralis*; entire upper surface with a feeble green bronze luster which is a little more pronounced at the margins. There is a very fine alutaceous sculpture and minute scattered punctulation, especially in the female, more easily detectable than in *ventralis*, but still scarcely visible under low power. The lower surface is rufous or rufo-testaceous, sometimes quite uniform in tint, but often with the ventral segments in part darker.

Male genitalia. Uniformly testaceous, median lobe a little narrower than the lateral ones, strongly flattened horizontally and nearly parallel-sided for some distance before the apex, which is rounded or feebly angulate.

Length, 5.7 to 6.7 mm.; *width*, 2.9 to 3.6 mm.

Type locality.—Lake Superior.

This species is known to me from Massachusetts (Wakefield): New York (Chaumont River, Jefferson County; Waddington, St. Lawrence County; Ausable Point, Clinton County—Notman): Ontario (Ottawa and Hull—Beaulne; Nepigon—Fenyès): Manitoba (Winnipeg; Le Pas; Husavick; Selkirk; Piquitenay River; Kettle Rapids—Wallis): Montana (Missoula).

From the above it will be seen that *confinis* ranges from New England to Montana, occupying nearly the same territory as *ventralis*.

12. *Gyrinus plicifer* LeConte

Form rather broad and thick, approaching in these respects and in general tacies the still somewhat stouter *pachysomus* of the Atlantic region. Color above black, the sides broadly bronzed, the surface highly polished and without trace of alutaceous sculpture in either sex. Strial punctures of the elytra distinctly larger laterally than near the suture, the eleventh stria rather close to the margin; outer apical angle of the elytra with a short elevated plica close to the margin. Body beneath brownish red varying to dark castaneous, the epipleura commonly of a brighter rufous tint.

Male genitalia.—Of a rather dark brownish ferruginous tint, the middle lobe very narrowly linear in apical third, not more than about one-sixth as wide as the lateral lobes.

Length, 4.5 to 6.1 mm.; width, 2.5 to 3.5 mm.

Type locality.—San Diego, California.

Known to me also from Pomona, Pasadena, Palm Springs, Kernville and the vicinity of San Francisco (Alameda, Marin and Sonoma Counties) in California: Corvallis, Oregon: Huachuca Mountains, Arizona: Canon City, Colorado: Davis Mountains, western Texas.

This is one of the few species in our fauna possessing a positive unique superficial character in the small plica at the outer apical angle of the elytra, which when once appreciated offers a certain means of identification. It is distinctly more robust than any other species occurring in the region which it occupies.

13. ***Gyrinus pachysomus*** new species

Broadly oval, very convex, surface highly polished and without trace of alutaceous sculpture in either sex; sides broadly bronzed; punctures of striae near the suture very much finer than at sides; eleventh stria rather close to the margin. Body beneath nearly uniformly reddish brown.

Male genitalia.—Rufous or rufo-testaceous, middle lobe parallel-sided and feebly convex apically, about half as wide as the lateral lobes, the apex evenly rounded.

Length, 5.5 to 6.2 mm.; width, 3.15 to 3.6 mm.

Type locality.—Southern Pines, North Carolina. Type in the author's collection.

The type is a male sent me by Rev. A. H. Manee and bears date V-5-1915. There are also before me specimens from Fredericksburg, Virginia (Richardson), and Mobile, Alabama (Loding).

The rather large size and robust convex form make this one of our most easily recognizable species. *Elevatus* is about equally thick bodied and of the same color beneath, but is a much smaller species.

14. ***Gyrinus elevatus*** LeConte

Rather small, strongly convex, the point of maximum elevation of the longitudinal profile being slightly in advance of the middle of the length. Above black with sides conspicuously bronzed, surface highly polished and without trace of minute punctulation or alutaceous sculpture in either sex. Strial punctures much finer near the suture than near the margins; eleventh

stria almost marginal except for a short distance at middle. Body beneath rufo-testaceous or rufo-brunneous, the metasternum sometimes a little darker in tint.

Male genitalia.—Color rufo-testaceous, middle lobe becoming rather abruptly linear in about apical two-fifths, the linear portion about one-fifth as wide as the lateral lobes.

Length, 4.6 to 5.15 mm.; width, 2.5 to 2.7 mm.

Type locality.—"New York"; from the Harris Collection.

Inasmuch as all other specimens seen by me are from Florida, it is not impossible that there may be an error in the type locality. *Elevatus*, according to Schwarz is common in Florida, and judging from the numerous localities cited by Leng and Mutchler³ must be generally diffused in the state. St. Augustine, Lake City, Gulf Hammock, Lake Okechobee, Orange County, and Dunedin are among the specific localities mentioned. At the last named place it has been taken by Blatchley, who says he has never seen large colonies, but only from one to half a dozen specimens at a time. Quite possibly this may be due to the season (winter and spring) at which collecting was done.

There are very few species with which *elevatus* is likely to be confused, *woodruffi* alone of the species of somewhat similar size and rufous ventral surface approaching it in convexity of form. In *woodruffi*, which is really a smaller species, the eleventh elytral stria is distinctly more distant from the margin.

There is a distinct possibility that the present species may be the true *limbatus* of Say, which was described from Georgia and East Florida; Say, however, indicates by his measurements a species slightly larger than *analis*, which is not true of *elevatus* except when its largest individuals are compared with the smallest of *analis*.

15. *Gyrinus consobrinus* LeConte

Of the same medium size, moderate convexity, highly polished surface luster, and color, as in *aquiris*, from which I know of no means of separating it except by genitalic characters, and even these are strikingly similar, the median lobe of the oedeagus being in *consobrinus* a little less than half as wide apically as the lateral lobes, while in *aquiris* the width is as nearly as may be one-half of the lateral lobes. If on the study of a larger number of specimens it should be found that this difference is not constant, the two

³Bull. Amer. Mus. Nat. Hist., xxxviii, p. 97, 1918.

may have to be united under the older name—*consobrinus*. At present, one has only to look at the locality label to distinguish them.

Male genitalia.—The same as in *aquiris*, except as noted above.

Length, 4.9 to 5.7 mm.; width, 2.6 to 3.15 mm.

Type locality.—San Francisco, California.

The following localities are represented in my series: Shasta Retreat and Dunsmuir in Siskiyou County (Blaisdell), Napa, Bear Lake (6000 ft., San Bernardino County—Martin), all in California. Provo and Salt Lake City, Utah.

16. ***Gyrinus aquiris*** LeConte

Of moderate size and convexity, form rather narrow, black above with slight bluish reflections, sides moderately bronzed, surface strongly polished in the male with very minute scattered punctures, visible only with a one-fourth inch triplet; nearly as shining in the female, with an extremely fine alutaceous sculpture detectable posteriorly, and with similar but rather more numerous minute punctures than in the male. Strial punctures only slightly larger in the lateral rows, eleventh stria almost strictly marginal. Body beneath reddish brown with the median areas, especially of the abdomen, darker.

Male genitalia.—Rufo-testaceous, often a little darker in tint basally; median lobe apically about half as wide as the lateral lobes, obtusely carinate above apically, with the tip subacutely rounded.

Length, 4.9 to 5.9 mm.; width, 2.55 to 3.15 mm.

Type locality.—"Middle States." The type bears a pink disk locality label and is probably from Pennsylvania.

The following localities are known to me—Canada (Montreal): Massachusetts (Tyngsboro; Wakefield; Sherborn (Frost): New York (Ithaca; Ausable Point; Crown Point; Chaumont River; Tivoli—Notman; Staten Island—Davis): Wisconsin (Beaver Dam; "Wis.").

The characters of critical value in identifying the present species are the brownish or reddish brown ventral surface becoming diffusely paler at the margins, and the eleventh elytral stria very close to the margin. Two other species—*lecontei* and *consobrinus* share the same characters. *Lecontei* inhabits substantially the same region as *aquiris* and is therefore most likely to be confused with it. When series are compared *aquiris* is quite readily seen to be of more elongate form; the character is, however, a little difficult to apply with a single individual or only a few specimens at hand. The male genitalia are quite distinct in the two species, and if the mere tip of the oedægus

is exposed, the difference in color—brownish piceous in *lecontei* and rufo-testaceous in *aguiris*—will at once settle the question. *Consobrinus* is even closer to *aguiris*, and I am quite convinced that there are no superficial characters by which they may be certainly distinguished; *consobrinus*, however, is a Pacific Coast species extending its range eastward to Utah, and I do not know that their ranges overlap at any point.

17. ***Gyrinus lecontei*** new species

Rather broadly oval, moderately convex, black with bluish reflections, sides conspicuously green bronzed; surface highly polished, with an excessively fine alutaceous sculpture and sparse extremely minute punctulation, barely detectable with a one-fourth inch triplet; stria punctures only very slightly coarser at sides, eleventh stria quite close to the margin. Beneath brownish ferruginous with diffusely paler margins

Male genitalia.—Piceous brown, becoming paler basally; median lobe gradually acuminate from base to tip, the apex superiorly carinate (roof shaped).

Length, 5.2 to 6.2 mm.; width, 2.85 to 3.4 mm.

Type locality.—Sherborn, Massachusetts. The type is a male collected and given me by Mr. C. A. Frost and bears date XI-18-17.

This is the species which LeConte supposed to be the *ventralis* of Kirby. It occurs commonly in the region extending from New England to the Great Lakes. The following localities are known to me.

Maine (Monmouth and Paris): New Hampshire (Farmington; Starr Lake, Mount Washington): Massachusetts (Sherborn; Framingham; Natick; Wellesley; Swampscott; Tyngsboro): New York (Ithaca; Keene Valley; Westfield): Michigan (Agricultural College—H. E. Weed): Illinois (Chicago; "N. Ill."): Wisconsin: Ontario (Toronto).

In the color of the lower surface this species agrees closely with *aguiris* and *consobrinus*, and is especially likely to be confounded with the former, which occurs in the same region. *Aguiris* is of somewhat narrower form and averages a little smaller than *lecontei*, but recourse to the genitalia is necessary for certainty in separation.

18. *Gyrinus maculiventris* LeConte

Form rather elongate, moderately convex, above black, highly polished, sides of elytra green bronzed, alutaceous sculpture only detectable under high power. Punctured striae not impressed, the outer ones a little coarser, the eleventh close to the margin. Body beneath black bronzed, pro- and epipleura and sides of ventral segments rufous.

Male genitalia.—Color dark brown to brownish testaceous; middle lobe with tip narrow, tip laterally compressed so as to be vertical in plane.

Length, 5 to 6.4 mm; width, 2.5 to 3.25 mm.

Type locality.—Lake Superior.

Known to me from New Jersey (Lake Hopatcong): Michigan (Huron Mountain Club): Illinois ("N. Ill."): Iowa (Elma—Wickham): Minnesota (Duluth): South Dakota (Brookings and Volga): Manitoba (Winnipeg; Aweme; Husavick; St. Norbert; Le Pas; Mile 256, Hudson Bay Railway; Piquitenay River): Alberta (Edmonton).

A northern species of moderately large size and rather narrow form, at once recognizable by the bright rufous sides of the ventral segments contrasting sharply with the dark median area. The species seems to be very abundant north of Lake Superior and in Manitoba.

19. *Gyrinus pleuralis* new species

Size large, form moderate, rather flatly arched in profile; black, sometimes slightly aeneous, highly polished, sides evidently but not very conspicuously green bronzed; entire surface of elytra rather thickly micro-punctulate and minutely alutaceous in both sexes, the sculpture better defined toward the apex, becoming barely visible at base; striae punctures fine, a little stronger in the outer rows. Trunk beneath metallic black, anal segment more or less rufescent apically as a rule; hypomera and epipleura varying from clear rufous to rufo-piceous.

Male genitalia.—Brownish piceous; middle lobe gradually decreasing in width from base to the narrowly rounded tip, the upper surface carinate in more than apical half. At a distance from the tip equal to the apical width of the lateral lobes, the middle lobe is one-half as wide as the latter.

Length, 6.2 to 7 mm.; width, 3.3 to 3.75 mm.

Type locality.—Laramie, Wyoming. The type, in the author's collection, is a male collected by Prof. Wickham. Paratypes are in his collection.

The following additional localities are represented in the small series at hand. Gunnison, Colorado (Fenyès): Lethbridge, Alberta (Wallis): Washington State ("W. T."): Tulumne County, California.

This species, by its metallic black under-body, with thoracic flanks and epipleura rufous, agrees with *affinis*, and as in *affinis* individuals occur in which the epipleura are so dark as to be quite deceptive. The average size is at least as great as in *affinis*, but the form is less broad, and the punctulate rather than striolate upper surface will at once distinguish it.

20. ***Gyrinus affinis*** Aubé

Form broadly oval and only moderately convex, shining black with faint bluish reflections, sides rather narrowly bronzed; surface without evident alutaceous sculpture, but covered throughout with a system of short, very fine, more or less oblique scratches, not differing in the sexes. Outer stria punctures only slightly coarser, eleventh stria quite near the margin. Body beneath metallic black, pronotal hypomera, epipleura and anal ventral segment more or less distinctly rufous.

Male genitalia.—Dull rufo-testaceous, the median lobe brownish at apex. Median lobe very slender (linear) in about apical third, thence gradually widened to base.

Length, 5.6 to 7 mm; *width*, 3.15 to 4 mm.

Type locality.—"United States."

A very common and widely dispersed northern species, known to me from Maine (Paris; Monmouth): New Hampshire (Farmington): Massachusetts (Wakefield; Natick; Monterey): Connecticut (Litchfield): New York (Keene Valley; Mount Marcy): Quebec (Hull): Michigan (Pontiac; Alger County): Alberta (Edmonton): British Columbia (McBride): Washington (Olympia): Oregon: California (Dunsmuir; Lake Tahoe; Huntington Lake, Fresno County, 7000 ft.—Blaisdell).

It is not entirely certain that this is the true *affinis* of Aubé, but it is the species so identified by LeConte, and we have no other which so well fits Aubé's description. Of a certainty, no North American *Gyrinus* is more likely to have found its way into European collections than this large, widely dispersed and generally abundant species. Undoubtedly this is the *canadensis* of Regimbart, who compares it with *affinis*, with which he says it is generally confused. Aubé says of *affinis*—"male very finely reticulate, female smooth." Regimbart says of *affinis* that both male and female are finely but strongly punctulate, and that the female in addition possesses an extremely fine reticulation in the form of oblique elongated areolae. Of his *canadensis* Regimbart says, that in both sexes

the elytra are covered with very distinct transversely oblique striolae but without reticulation, which perfectly defines the species we are considering. As for Aubé's statement, we have no known species of *Gyrinus* with reticulate males and smooth females, and are forced to conclude that either his male was abnormal or his supposed sexes were of different species. Regimbart's characterization of *affinis* does not at all agree with Aubé's as to surface sculpture, and as he seems in no instance to have seen Aubé's types, it is likely that his *affinis* is not that of Aubé. The matter is thus somewhat involved, and it looks as though actual study of types will be needed to straighten it out. Meanwhile I think it best to follow LeConte in using the name *affinis* for our species with the fine oblique striolation, a character which distinguishes it from every other species of our fauna. In size, *affinis* is only equalled or exceeded by *pleuralis* and the rare *impressicollis*. The color of the epipleura is typically rufous, but specimens often occur with the color so obscure as to seem black at first glance.

21. ***Gyrinus pectoralis* LeConte**

This species is at once separable from all others of our fauna by the anterior margin of the metasternum being emarginate and impressed each side, giving a trilobed outline. The species has no other salient characters. It is of average size, broadish oval form and moderate convexity; black, margins usually narrowly and feebly bronzed, but often not at all so; surface polished and without definable alutaceous sculpture in either sex, but with numerous very minute dispersed punctures; striae punctures moderate, not or scarcely larger in the outer rows. Beneath, metallic black, the anal segment concolorous or at most slightly brownish; legs dull rufous, the posterior thighs often slightly dusky.

Male genitalia.—Brownish piceous, paler basally; middle lobe gradually narrowed, about half as wide as the lateral lobes at a distance from the tip equal to the width of the latter, obtusely carinate above apically, the tip narrowly rounded.

Length, 4.3 to 5.6 mm.; width, 2.4 to 3 mm. The lower limit is that of an exceptionally small example, the greater number of specimens being 5 mm., or a little more in length.

Type locality.—Lake Superior. LeConte also gives Hudson Bay region.

The species is strictly a northern one; it is known to me from Manitoba (Winnipeg; Onah; Piquitenay River; Mile 256,

Hudson Bay Railroad—Wallis): Alberta (Edmonton—Carr): Montana (Missoula—A. B. Wolcott): Washington (Olympia—Kincaid).

22. **Gyrinus parvus** Say

Form strongly convex, nearly symmetrically arched in profile; black, sides distinctly and rather broadly bronzed, surface in the male polished and not visibly alutaceous, in the female very finely alutaceous and moderately shining, the micro-sculpture more evident toward the sides and apex; stria punctures rather coarse, especially toward the sides, where the rows are visibly impressed; eleventh stria strictly marginal throughout. Body beneath metallic black, anal segment not or only feebly rufescent, legs rufous.

Male genitalia. Dark rufous or rufo-piceous, middle lobe obtusely carinate, one-half as wide apically as the lateral lobes, the tip rounded.

Length, 4.25 to 5.3 mm.; *width*, 2.4 to 2.8 mm.

Type locality.—Mexico.

Known to me from Western Pennsylvania (Jeannette—Klages): Kansas (Onaga; Douglas County; "Kansas Williston"—Snow): Texas (San Antonio; Brownsville; Davis Mountains): California (San Diego—Blaisdell). It also occurs through Mexico and Guatemala to Peru and Chile—a most extraordinary range in latitude.

The rather small size, very convex form, coarse stria punctures with slightly canaliculate lateral rows, are the superficial characters usually relied upon to distinguish this species. To these it should be added that the eleventh stria is so truly marginal throughout as to be scarcely visible when the insect is viewed in the plane of the reflexed margin. This condition does not obtain so perfectly in any of our other species. In *borealis* and *pugionis* only, are the lateral striae of the elytra as distinctly impressed, and both these species are materially larger and practically outside the range of *parvus* so far as we now know.

23. **Gyrinus borealis** Aubé

Form rather stout and convex; black, sides bronzed; moderately shining, elytra very minutely alutaceous throughout, a little more distinctly so in the female, minute punctulation nearly wanting; stria punctures close set, obviously larger at sides, where the striae are very distinctly impressed. Beneath black, last segment commonly brown, at least in part; legs clear rufous.

Male genitalia.—Brownish yellow, middle lobe strongly narrowing, superiorly flattened in basal third, carinate in middle third, slender and subcylindrical in about the apical third, which is about one-fourth as wide as the lateral lobes.

Length, 5.5 to 6.2 mm.; *width*, 3 to 3.6 mm.

Type locality.—Not stated.

This seems to be a rather scarce species, and only a few scattering specimens have come to hand. These bear the following locality labels: Sherborn and South Framingham, Massachusetts (Frost): Wellesley, Mass. (Morse): Amherst, Mass. (Cornell Univ. Coll.): Lahaway, New Jersey (Davis): Ramsey, N. J. (Sleight): Fredericksburg, Virginia (Richardson).

I have followed LeConte in his interpretation of this species, but am by no means sure that it is the true *borealis* of Aubé. Its most notable superficial character—the rather strongly impressed lateral striae is not mentioned by Aubé; in fact he uses the expression “*interstitiis planis*.” On the other hand, Regimbart's description of *borealis* seems to fit our species exactly, possibly because he describes from specimens sent by LeConte. The *corpulentus* of Regimbart appears to be virtually identical, except that he describes the epipleura as ferruginous. As in several of my specimens of *borealis* the epipleura are more or less aeneo-rufescent, I suspect that *corpulentus* is no more than a variety of this sort. Superficially *borealis* is scarcely distinguishable from the following species, which see for a comparative statement.

Since writing the above I have received from the British Museum Collection a “type” of Regimbart's *corpulentus*, and find it to be exactly the *borealis* of LeConte.

24. *Gyrinus pugionis* new species

In form, size, sculpture and luster this species is practically indistinguishable from *borealis*, the only noticeable difference that I have discovered being that here the sides of the ventral segments are narrowly rufous or rufescent, somewhat as in *maculiventris*, but more narrowly and diffusely so. The epipleura, as in *borealis*, are at times somewhat rufescent, but perhaps rather less markedly so.

Male genitalia.—Of same type as in *borealis*, color rufo-testaceous, terminal linear portion extremely slender, hardly more than one-sixth as wide as the lateral lobes, and twice as long as the width of either of the latter.

Length, 5.8 to 6.3 mm.; width, 2.95 to 3.5 mm.

Type locality.—Saugus, Massachusetts. Type (♂) in the author's collection.

This species seems quite as scarce as the preceding, and I have before me only six examples, as follows: Maine (Bar Har-

bor, ♂ ♀, collected VII 29 by C. W. Johnson): New Hampshire (Holderness, 1♂, Prof. A. P. Morse): Massachusetts (Saugus, 1 ♂—type, 1 ♀ from Bridgewater, both from collection of F. Waldo Dodge). New York (Chaumont River, Jefferson County), IX-21-19, 1 ♂—Notman).

So far as seen, this species is separable with certainty from *borealis*—the only one which it strongly resembles—by the paler lateral margins of the ventral segments, but if this should fail the genitalic characters offer a definite means of identification.

25. **Gyrinus pernītīdus** LeConte

Of somewhat less than medium size, form rather strongly convex. Above black, sides usually bronzed, surface highly polished and without visible micro-sculpture in either sex. Punctures moderate, those of the lateral rows a little larger. Body beneath metallic black, last ventral typically and usually more or less rufous, epipleura and hypomera sometimes faintly rufous.

Male genitalia.—Reddish brown, median lobe slightly dilated apically, where it is fully three-fourths as wide as the lateral lobes; angulate at tip, upper surface a little concave apically and with a median carina which does not attain the apex.

Length, 4.9 to 5.2 mm.; *width*, 2.6 to 2.9 mm.

Type locality.—Georgia. Described from a single female, with which LeConte unites a Massachusetts female from Dr. Harris.

This species is probably not rare from Maine to New Jersey, but is usually mixed with other species in collections. It is known to me from Paris, Maine: Farmington and Hooksett, New Hampshire: Wakefield, Tyngsboro and Sudbury, Massachusetts: Chatsworth and Atco, New Jersey: Indiana (*piceolus* Blatchley).

In a fairly good series, *pernītīdus* shows rather less variation in size than usual, the great majority of specimens running pretty close to 5 mm. in length. LeConte gives a length of 6 mm. in his description, but his type really measures 5.7 mm. to the tip of the elytra, the largest example I have seen.

The species seems quite constant in its other characters, about the only variation worthy of notice being in the color of the anal segment and of the epipleura, the latter being not rarely slightly rufescent at base, and occasionally more completely so. I believe that *piceolus* Blatchley is merely an ex-

trene variant of this sort, as it shows no other distinguishing characters. *Pernitidus* should not be difficult to recognize among the species of its own region with black under-body. It is perhaps most likely to be confounded with *analis*, but the latter is a narrower, less convex and more aeneous species, and neither it nor any other species with black under surface occurring in the Atlantic region is completely devoid of alutaceous sculpture in both sexes, as is virtually the case with *pernitidus*.

26. ***Gyrinus picipes* Aubé**

Of average size and moderate convexity; highly polished black with sides distinctly bronzed. Some specimens appear to be absolutely smooth, others show an extremely fine alutaceous sculpture, barely or scarcely detectable except towards the apex; there is also present or not an excessively minute punctulation which is of variable visibility. Strial punctures very fine near the suture, evidently larger at sides. Body beneath metallic black, the epipleura frequently tinged with rufous; anal segment more or less rufous or rufescent.

Male genitalia. Brown or piceous brown; middle lobe about one-third as wide as the lateral lobes apically, upper surface flattened before the apex, and with a very minute obtuse prominence at the extreme tip.

Length.—4.7 to 6 mm.; width, 2.6 to 3.2 mm.

Type locality.—Norfolk Sound.

I have seen examples from the following localities: Alaska (Sitka—LeConte Coll.; Homer): British Columbia (McBride and Cawston): Washington (Port Townsend and Olympia): California (Humboldt County; Alhambra Valley, Contra Costa County; Crystal Springs, San Mateo County; Kernville; Mt. Kaiser, 9000 ft., Fresno County); Alberta (Banff): Manitoba (Mile 256, Hudson Bay Railway): Montana (Missoula).

In the Pacific district, from British Columbia south, there is no other species with which this need be confused, but in the more northern and eastern parts of its range the more shining examples of *opacus* and *lugens* somewhat resemble it, though normally, or in series, these are both much more evidently alutaceous, and the strial punctures of the outer rows are scarcely larger than of those nearer the suture.

In his remarks upon *picipes* in his paper of 1868, LeConte alludes to "types from Alaska kindly sent me by Baron Chaudoir and Count Mnizech." These agree completely with Aubé's description, and may, I think, be safely accepted as

authentic. Notwithstanding the name, the legs are ferruginous in color, precisely as called for by the description.

The Labrador examples which LeConte refers here, as well as the Lake Superior specimens which he designates as a race of the present species, are all *opacus* Sahlberg.

27. ***Gyrinus lugens* LeConte**

Form rather broad, though somewhat variable; moderately nearly symmetrically convex; black, sides more or less bronzed; rather strongly shining but with a fine reticulato-alutaceous sculpture which is a little more evident in the female; minute punctulation sparse or nearly wanting in the male, generally more detectable in the female. Strial punctures moderate, not very noticeably larger in the outer rows, which are not appreciably impressed. Beneath metallic black, legs rufous, anal segment often more or less so, but frequently nearly or quite concolorous.

Male genitalia.—Piceous, middle lobe laterally compressed apically where it becomes very narrow from a vertical view point, but appreciably wider as seen from the side.

Length, 5.15 to 6.7 mm; *width*, 2.7 to 3.6 mm.

Type locality.—Massachusetts.

This is undoubtedly the commonest and most generally diffused *Gyrinus* in New England, and appears to be fairly abundant throughout the greater part of its range, which extends westward to Manitoba. I have not seen it from farther south than New Jersey and Pennsylvania. The following specific localities have been noted: Little River, Southwest Newfoundland (Bolster), 1 ♀, identity tolerably certain: Maine (Paris; Monmouth; Wales; East Machias; Mount Desert): New Hampshire (Starr Lake, Mt. Washington; Farmington): Massachusetts (Tyngsboro; Wakefield; Framingham; Wellesley; Sherborn; Dartmouth; Monterey; Nantucket): Connecticut (Litchfield): New York (Staten Island; Riverhead, Long Island; Westchester County; Ithaca; Keene Valley, Mount Marcy; Crown Point—Notman): New Jersey (Ramsay; Woodbury; Clementon; Atco): Pennsylvania: Michigan (Manistique; Huron Mountain Club): Ontario (Ottawa; Hull; Searchmont): Manitoba (Piquitenay River; Kettle Rapids).

LeConte says of this species "not at all bronzed above." This is only true of exceptional specimens and does not even quite apply to his type, which has one side margin feebly narrowly bronzed, the other not at all so. In the general run of

specimens the suture and side margins are bronzed in much the usual manner, sometimes obscurely, sometimes distinctly so. A little experience, with careful attention to the tabular characters will probably enable the student to recognize *lugens* without great difficulty, but the genitalic character is the only sure test. Only one other species of our fauna—*maculiventris*—has the oedeagus laterally compressed at tip. A similar structure exists in specimens of the European *marinus* sent me by Reitter, but this species so far as I know does not occur in this country. Its presence on our lists is due to the long persistent confusion of *opacus* Sahlberg with *marinus* Gyllenhal by European coleopterists, notwithstanding the fact that this error has been pointed out a number of times. For light on this matter see Sharp's essay on the British species of *Gyrinus*.⁴ *G. falli* Notman⁵ does not differ from *lugens*.

28. ***Gyrinus analis* Say**

Somewhat under medium size, form rather narrow and of medium convexity; upper surface uniformly bronzed, only slightly more strongly so narrowly along the margins. Male quite strongly shining and with barely detectable alutaceous sculpture toward the elytral apex; female less shining, the alutaceous sculpture visible throughout. Strial punctures not or only just perceptibly larger externally. Body beneath black bronzed, legs and anal segment ferruginous.

Male genitalia.—Reddish or yellowish brown, median lobe narrowing to about the apical two-fifths, thence subparallel and less than half as wide as the lateral lobes, the upper surface obtusely ridged, the tip narrowly rounded.

Length, 4.5 to 5.5 mm.; *width*, 2.5 to 3 mm.

Type locality.—Not stated, but probably Pennsylvania.

One of our most widely dispersed species, occurring from Nova Scotia to Kansas and south to Georgia and Louisiana. The following localities are represented in my series. Nova Scotia (Kempf Shore): Ontario: New York (Ithaca): Pennsylvania (Philadelphia and vicinity): North Carolina (Southern Pines): Georgia (Billy's Island, Okefenokee Swamp—Bradley): Alabama (Mobile; Whistler): Florida ("S. R."—J. Corse): Louisiana (Winnfield): Arkansas (Silver Springs): Indiana (Milers): Illinois (Chicago); Michigan (Berrien County; Walnut Lake—Andrews): Wisconsin (Beaver Dam): Iowa (Iowa City; Muscatine—Wickham): Kansas (Reno County; Douglas County).

⁴ Entom. Monthly Mag., (2), xxv, pp. 128-138, pls. ix-x, June 1914.

⁵ Bull. Brooklyn Ent. Soc., xiv, p. 131, (1919).

This species is less difficult to identify by superficial characters than many others, the smallish size, rather narrow form, uniformly bronzed surface, the female evidently though very finely alutaceous, the male scarcely visibly so, the rufous anal segment, forming a combination of characters which fits nothing else. It seems to be especially abundant in the more southern part of its range. Regimbart mentions receiving a small flask of alcoholic material from Missouri, among which were three thousand examples of this species, from which he concludes quite naturally that it must be "prodigiously common." I have myself received from Prof. Bradley two vials of specimens from Silver Springs, Arkansas, containing probably two thousand examples, all of which appear to be *analis*.

29. ***Gyrinus opacus*** Sahlberg

Of medium size, not very convex; black, sides more or less evidently bronzed, usually rather obscurely so; luster rather dull, owing to the very fine alutaceous sculpture; there is also a very minute scattered punctulation which is somewhat variable in development; stria punctures rather fine and only a little larger laterally. Body beneath black, front legs dark rufous, their tibiae and tarsi tinged with piceous; middle and hind legs piceo-rufous, the tarsal claws yellowish.

Male genitalia.—Piceous or brunneo-piceous; middle lobe gradually narrowed from base to apex, carinate above, about four-fifths as wide apically as the lateral lobes, the tip angulate or subangulate.

Length, 4.8 to 6.2 mm.; *width*, 2.5 to 3.3 mm.

This species ranges entirely across the continent from Labrador to Alaska. Specimens are before me from West St. Modest, Labrador (Sherman Coll.): Cochrane, Northern Ontario (Notman—listed as *picipes*⁶): Kettle Rapids, Manitoba (Wallis): Edmonton, Alberta (Carr): Pigeon Cove, Alaska Peninsula (Kusche—sent by Van Dyke). The European distribution as given by Sharp, is "arctic Norway and Lapland southwards to the Highlands of Scotland." It occurs also in Iceland and Greenland.

This is the only species in our fauna with legs so dark as to merit the name *picipes*, and as remarked by Blanchard in the letter quoted by Mr. Sherman in his Labrador List,⁷ it seems as though it ought to be the *picipes* of Aubé, but whatever may

⁶ Journ. N. Y. Ent. Soc., xxvii, p. 92, (1919).

⁷ Journ. N. Y. Ent. Soc., xxviii, p. 188, (1910).

have been the color of the feet in the original specimens that Dejean catalogued under the name *picipes*, Aubé in his description specifically states that the feet are ferruginous.

There are in the LeConte collection three authentic examples of *opacus* from Greenland, and these differ in no respect from our Labrador ones. Specimens from the interior of the continent (Northern Ontario, Manitoba, Alberta) are, as a rule, distinctly smoother and more shining, and except for their darker legs are very similar to *lugens*, which occurs in the same region. The tarsal claws in *lugens* are, as in *opacus*, yellowish or pale rufous.

The confusion of *opacus* with the *marinus* of Gyllenhal is due, as explained by Sharp, to Suffrian's misinterpretation of Sahlberg's species, an error which persisted until detected by Seidlitz in 1887, and Regimbart in 1891.

I have seen no genuine American examples of *marinus* and very much doubt its occurrence with us, although Regimbart continued to record it in one or another of his Supplements as from "the United States," "North America," "Greenland," and "Hudson Bay."

30. *Gyrinus wallisi* new species

Form rather broadly oval, more depressed than usual; black, sides narrowly and obscurely bronzed; surface luster rather dull, owing to an extremely fine alutaceous sculpture and a rather dense minute punctulation covering the entire surface of the elytra. The elytral striae, especially in the females, show a tendency to become feebly impressed, more distinctly so toward the apex where the surface is notably uneven; stria punctures not or scarcely larger laterally. Body beneath metallic black, anal segment concolorous or nearly so; legs rufous, middle and hind femora more or less dusky; tarsal claws dark brown or piceous.

Male genitalia.—Piceous; middle lobe gradually narrowed to apex, where it is less than half as wide as the lateral lobes, flattened above at tip, which is narrowly rounded.

Length, 5.2 to 6.8 mm.; *width*, 2.85 to 3.6 mm.

Type locality.—Piquitenay River, Manitoba—Type ♂, in the author's collection.

The type series contains specimens also from Le Pas and Mile 256, Hudson Bay Railway, all collected and sent me by Mr. J. B. Wallis of Winnipeg, to whom it is a pleasure to dedicate the species, in recognition of his enthusiastic and successful quest of the Gyrini of his region.

The rather dull luster and surface sculpture of this species is more remindful of *opacus* than of any other, but the rather broader and slightly flatter form, together with the dark claws should distinguish it without much difficulty. In range, *wallisi* is thus far one of our most restricted species, having been taken only along the line of the Hudson Bay Railway, in the flat marshy lake region between Lake Winnipeg and Hudson Bay. How far to the east or west it may yet be found is problematical, but it has not yet been taken by Carr at Edmonton, nor did Notman find it at Cochrane, North Ontario.

Since the above was written I have seen an example in the Cornell University collection labelled "Ontario Can."

31. ***Gyrinus frosti*** new species

Broadly oval, moderately convex, distinctly gibbous in profile, the highest point of the arch being well up toward the base of the elytra; black, sides rather narrowly and feebly bronzed, surface luster only moderate, being dulled in both sexes by the very fine alutaceous ground sculpture; striae punctures rather fine, only slightly larger in the lateral rows. Beneath metallic black, anal segment often more or less rufous or rufo-piceous; legs rufous, the middle and hind thighs sometimes a little dusky at base.

Male genitalia.—Dull rufous, the middle lobe more or less dusky apically; middle lobe broad, arcuately expanded and superiorly concave (spatuliform) apically, where its width is subequal to that of the lateral lobes; tip either broadly rounded or subangulate.

Length, 4.8 to 6.3 mm.; *width*, 2.7 to 3.6 mm.

Type locality.—Monmouth, Maine (Lake Wilson). The type is a male, collected and given me by Mr. C. A. Frost, and bears date "IX-4-17."

The following localities are represented in my series: Maine (Monmouth): Massachusetts (Natick; Monterey—Frost): Connecticut (Litchfield—Woodruff): New Jersey (Clementon; Lake Hopatcong): New York (Ithaca): Pennsylvania (Philadelphia Neck): Louisiana (Winnfield—G. R. Pilate).

A single pair of specimens from Louisiana has been seen: the male is normal in every way, the female, however, is distinctly bronzed over the entire surface.

With a little experience this very distinct species may usually be recognized by its rather broad form, distinctly gibbous in profile, and the relatively dull surface luster: the male genitalia are unique. There is a bare possibility that this species may

be the *gibber* of LeConte, represented solely by the unique type; the gibbosity in the latter is, however, still more pronounced, the general form more convex, the cross section distinctly angulate at the suture.

32. *Gyrinus gibber* LeConte

The unique female specimen described by LeConte under this name in 1868 seems never to have been duplicated. The name is strikingly suggested by the bodily form, which is quite strongly gibbous in longitudinal profile, and is distinctly angulate at suture in transverse section. The type is of broadly oval form, the side margins widely reflexed, the surface only moderately shining, reticulato-alutaceous but without or nearly without fine punctulation; punctures of lateral striae not coarser. Body beneath metallic black, last segment dark brown, legs ferruginous.

Length, 5 mm.; *width*, 2.9 mm.

Type locality.—North Carolina (Zimmerman).

Although rather extreme in its degree of gibbosity of outline, there is nothing besides this singularity to suggest malformation, and I am by no means ready to pronounce the specimen a freak, as has been done by Horn, in his "Notes from the Museum at Cambridge"⁸ where he declares it to be "simply a deformity of *analis*." Whether an abnormal individual or not, there is certainly nothing whatever to connect it with *analis*, and if it is to be assigned to any of the species here recognized, it is that to which I have given the name *frosti*. If the thick humped form of *gibber* is really an abnormality, then it is quite likely that *frosti* is the normal form; but with our present meager knowledge of the Gyrind fauna of North Carolina, it is unwise to make such assumption.

33. *Gyrinus impressicollis* Kirby

Broadly oval, moderately convex, side margins wide, outline less continuous than usual, there being a distinct but very obtuse angle at the junction of the prothorax and elytra. Above black, surface throughout slightly aenescant, a little more distinctly so at lateral margins. Surface in female distinctly reticulato-alutaceous and dull, minute punctulation nearly lacking; male more finely alutaceous, more shining, and with an evident minute punctulation. Strial punctures fine, not metallic, scarcely coarser laterally, occupying at sides distinctly impressed grooves, which become very feeble near the suture. Body beneath metallic black, anal segment concolorous; legs rufous, a faint dusky diffuse cross bar at basal third of middle and hind thighs; claws piceous.

⁸ Trans. Am. Ent. Soc., xii, Suppl. Proc. Ent. Sect., p. xiii, (1886).

Male genitalia.—Piceous brown; broad and strongly concave superiorly, both lateral and median lobes strongly curved upward, the former gradually narrowed to the truncate tips, the latter subacute at the slightly reflexed apex.

Length, 7 to 7.8 mm.; *width*, 4 to 4.3 mm.

Type locality.—"Canada, taken by Dr. Bigsby."

Of this extremely rare species, Regimbart, in the Third Supplement to his Monograph gives us a detailed description, drawn from a single female specimen which was sent him by Mr. Arrow of the British Museum, as being apparently the same as Kirby's type, described in 1837. This specimen is said to be from Lake Huron. So far as I know, no other examples had been taken down to the summer of 1917, when in looking over a mixed lot of Gyrini taken by Mr. J. B. Wallis along the Hudson Bay Railway, six specimens of very large size attracted my attention, and suggested the possibility that I had before me representatives of this almost mythical species. That these are the true *impressicollis* I have now no doubt whatever. They were taken at Piquitenay River, July 6, 1917.

Aside from the size, which is conspicuously greater than of any other species known to us, I note that the basal joint of the anterior male tarsus is here as broad as any that follow, while in all our other species it is distinctly less wide than the two following joints. Furthermore the first ventral segment is shorter and the fifth is longer than in any other species; while the genital organs are absolutely unlike anything else in the genus.

*List of North American Species of Gyrinus, with Original
Bibliographic Citations*

Owing to the numerous erroneous references, a complete bibliography is not attempted. The only works that the student need consult are the papers of Aubé and LeConte, and the monograph of Regimbart with its several supplements.

1. *G. minutus* Fabricius, 1801, Syst. Eleut., i, p. 276.
2. *G. rockinghamensis* LeConte, 1868, Proc. Acad. Nat. Sci. Phila., 1868, pp. 370, 373.
3. *G. ventralis* Kirby, 1837, Faun. Bor. Amer., iv, p. 80.
4. *G. fraternus* Couper, 1865, Can. Nat., 2nd series, ii, p. 60.
5. *G. aeneolus* LeConte, 1868, loc. cit., p. 368, 370.
6. *G. woodruffi* new species.

7. *G. marginellus* new species.
8. *G. dichrous* LeConte, 1868, loc. cit., p. 368, 371.
9. *G. latilambus* new species.
limbatus LeConte, nec Say.
10. *G. bifarius* new species.
11. *G. confinis* LeConte, 1868, loc. cit., p. 368, 370.
12. *G. plicifer* LeConte, 1851, Ann. Lyc. Nat. Hist., New York, v, p. 209.
13. *G. pachysomus* new species.
14. *G. elevatus* LeConte, 1868, loc. cit., p. 368, 371.
15. *G. consobrinus* LeConte, 1851, loc. cit., p. 209.
16. *G. aquiris* LeConte, 1868, loc. cit., p. 368, 371.
17. *G. lecontei* new species.
ventralis LeConte, nec Kirby.
18. *G. maculiventris* LeConte, 1868, loc. cit., p. 368, 371.
19. *G. pleuralis* new species.
20. *G. affinis* Aube, 1838, Spec., p. 669.
? canadensis Regimbart, 1883, Ann. Soc. Ent. Fr., 1883, p. 159.
21. *G. pectoralis* LeConte, 1868, loc. cit., p. 370, 372.
22. *G. parvus* Say, 1834, Trans. Am. Phil. Soc., p. 448; ed. LeConte, II, p. 562.
23. *G. borealis* Aubé, 1838, Spec., p. 692.
? corpulentus Regimbart, 1883, Ann. Soc. Ent. Fr., 1883, p. 178.
24. *G. pugionis* new species.
25. *G. pernitioides* LeConte, 1868, loc. cit., p. 369, 372.
26. *G. picipes* Aubé, 1838, Spec., p. 694.
27. *G. lugens* LeConte, 1868, loc. cit., p. 369, 372.
28. *G. analis* Say, 1825, Trans. Am. Phil. Soc., II, p. 108; ed. Le C., II, p. 520.
29. *G. opacus* Sahlberg, 1817, Ins. Fenn., IV, p. 45.
30. *G. wallisi* new species.
31. *G. frosti* new species.
32. *G. gibber* LeConte, 1868, loc. cit., p. 370, 372.
33. *G. impressicollis* Kirby, 1837, Faun. Bor. Amer., IV., p. 79.

Unidentified Species

- G. sayi* Aubé, 1838, Spec., p. 698.
G. lateralis Aubé, 1838, Spec., p. 673.
G. fuscipes Motschulsky, 1859, Bull. Soc. Nat. Mosc., II, p. 173.
G. marginiventris Motschulsky, ibid., p. 174.

EXPLANATION OF PLATE XVI

Male genitalia as viewed from above. The numbers are those attached to the species in the above list. Figures 33a and 33b show superior and lateral views respectively. In figures 18 and 27 the side view of the tip of the middle lobe is also shown.

STUDIES IN COSTA RICAN DERMAPTERA AND ORTHOPTERA

BY JAMES A. G. REHN

My interest in the Orthopterous fauna of Costa Rica extends back to the year 1903, when in three papers¹ were recorded the first collections from that country examined by me. Since that time much additional Costa Rican material has passed into my hands, many species have been recorded and numerous ones described, but a very large portion of these collections is as yet unreported. Much progress has been made in the development of our knowledge of the Dermaptera and Orthoptera of Mexico, Central America and northwestern South America, and a far better groundwork for resumed study is now available.

For a number of years one of my greatest desires has been to prepare a comprehensive catalogue and faunistic study of Costa Rican Dermaptera and Orthoptera. For a tropical region of greatly diversified conditions, the fauna of Costa Rica is as rich as, and, relatively speaking, probably better known than, that of any other country of similar size within the American tropics. There exists a possibility of the realization of my desire in the not too distant future, and a definite amount of study time is now being given to the extensive collections in hand. *These I hope to be able to supplement, before final publication, with additional, personally secured, material and observations.

As it appears desirable to make known new forms recognized, and important changes or synonymy necessitated as the work progresses, papers under the title here given will be brought out from time to time.

¹ Studies in American Forficulidae. Proc. Acad. Nat. Sci. Phila., 1903, pp. 299-312. Studies in American Blattidae. Trans. Amer. Entom. Soc., xxix, pp. 259-290. On Two Earwigs of the Genus *Labia* from Costa Rica. Entom. News, xiv, pp. 292-293.

PAPIER ONE

TWO NEW GENERA AND THREE NEW SPECIES
OF DERMAPTERA

A study of the Dermaptera material now in hand, and a correlation of all published Costa Rican records of the order, has been completed, and the present small contribution treats of the undescribed material located. One of the genera described as new is based on a species long known; a better acquaintance with its relatives makes its generic separation imperative. The other new genus is necessitated by the rediscovery of the genotype of the genus *Neolobophora*.

LABIIDAE

LABIINAE

Prolabia calverti new species (Plate XVII, fig 1.)

A member of the *Arachidis* Group of the genus and far more closely related to *P. triquetra* Hebard,² from southern Mexico, than to the other species of the assemblage. In general form the present species is very similar in the male sex to *triquetra*, but the forceps, while of the same general type, have their form less robust, their dorsal carinae nearer the median line of the branches, and the proximo-internal tooth is a more rounded tubercle; the pygidium of the male is proportionately shorter and broader than in *triquetra*, its caudo-lateral angles are less pronounced, the distal margin subtruncate and the dorsal surface inflated with an evident medio-longitudinal sulcation. From *arachidis* the present species is markedly distinct, showing much the same differences as *triquetra*. The feature of pygidial inflation is marked and quite diagnostic.

Type.—♂; Reventazon Valley below Juan Viñas, Costa Rica. Elevation, 2500 feet. May 1, 1910. (P. P. Calvert; from unrolled *Heliconia* leaf.) [Academy of Natural Sciences of Philadelphia, Type no. 5379.]

² Trans. Amer. Entom. Soc., XLIII, p. 417, pl. xxviii, figs. 5, 6 and 7, (1917), (Orizaba (type locality) and Minatitlan, Vera Cruz, Mexico; Chalchicomula, Puebla, Mexico).

Size small; form moderately slender, less robust than in *triquetra* and much more slender than in *arachidis*; surface moderately polished with exceptions noted below.

Head in outline broad pyriform, greatest width across eyes faintly less than greatest length of same; interantennal-interocular region with its central area subdeplanate; occiput with paired arcuately and transversely disposed impressions,³ which are separated mesad, in contact with eyes laterad; caudo-lateral occipital angles well rounded, this region with a few short bristle-like hairs; median portion of occipital margin shallowly obtuse-angulate emarginate. Eyes little prominent, slightly longer than postocular portion of genae. Antennae damaged.⁴

Pronotum subquadrate, slightly transverse; cephalic margin subtruncate, lateral margins approximately parallel, caudal margin broadly and entirely arcuate, passing into the lateral margins; surface of cephalic half of disk appreciably convex with a brief median sulcation cephalad, caudal section mesad with a subequal section reaching to caudal margin and weakly convex in transverse section, narrow cephalo-lateral and broad caudo-lateral portions subdeplanate. Tegmina as in *P. triquetra*, but distal margin weakly concave. Wings projecting distad of the tegmina somewhat less than one-half of length of latter, immediate apex narrowly truncate.

Abdomen short fusiform, much as in *triquetra*, surface largely and obscurely impresso-punctulate and almost completely without hairs; abdominal keels as in *triquetra* but distal pair more pronounced; anal segment rectangulate transverse, greatest length nearly three times in greatest width; distal margin with extremely slight projections above insertion of each forceps arm, these projections weaker than in *triquetra*, mesad this margin is truncate; surface of anal segment appreciably declivent meso-distad and there, near margin, with a brief median sulcation. Pygidium subquadrate, about one and one-third times as wide as long, lateral margins subparallel, caudo-lateral portions narrowly oblique truncate, distal margin subtruncate, non-cingulate, lateral angles of caudal margin with brief tuberculations; surface of pygidium markedly inflated and bullate, a deep medio-longitudinal sulcation indicated on proximal three-fourths. Forceps of the general type and form found in *P. triquetra*, but more slender and rather more regularly tapering, in section more nearly equilateral than in *triquetra*, as the dorsal carina instead of being internal in position, as in *triquetra*, more nearly approaches the median line of the arm, particularly mesad; proximo-internal tooth distinct though small, rounded tuberculate; internal margin distad of tooth unarmed; distal half

³ These impressions may have been produced by shrinkage of the chitin in the drying of this specimen, which had been preserved in alcohol, and for that reason we have not given them as diagnostic features. They are represented in *triquetra* only by slight indications, and, while quite regular in the present specimen, we prefer to await the acquisition of further material before citing them as distinguishing features. It is necessary, however, to discuss them in the general description on account of their striking character and, possibly normal, occurrence in the type.

⁴ These appendages were intact when first examined, both in spirits and dry, and the preliminary generic assignment was then made.

of arms with dorsal surface less deplanate than in *triquetra*, dorso-external face more concave than in *triquetra*; hairiness of forceps as evident as in *triquetra*, most pronounced on external surfaces. Penultimate sternite as in *triquetra*. Limbs robust, as in *triquetra*, femora inflated.

General color bone brown to clove brown on the head and pronotum, passing to russet on the abdomen and walnut brown on the forceps. Tegmina evenly paling in sutural half to hazel and on humeral angle to ochraceous-buff, the disto-lateral section remaining dark. Exposed portion of wings ochraceous-buff proximad, passing toward general color distad. Dorsum of abdomen with an indefinite infuscation mesad, which is marked only on anal segment. Pygidium dull ochraceous-tawny. Limbs of the general color, paling in the vicinity of the articulations and on the tarsi to buffy.

Length of body (exclusive of forceps), 6.2 mm.; length of pronotum, 1, greatest width of pronotum, 1.1; length of tegmen, 1.8; length of forceps, 1.9.

The type is unique.

It gives me great pleasure to dedicate this interesting species to its collector, my colleague Dr. Philip P. Calvert, as a token of esteem as well as appreciation of his kindly help and advice, often sought and here gladly acknowledged, and also in recognition of his important contributions to our knowledge of the entomology of Central America.

FORFICULIDAE

OPISTHOCOSMIINAE

As Hebard has already suggested,⁵ we feel convinced that the Neolobophorinae is not sufficiently distinct from the present subfamily to warrant its recognition as of equal rank. We feel also that the Opisthocosmiinae as here understood should, in a linear classification, precede the Ancistrogastrinae, and come between the Forficulinae, and probably Eudohrninae, and the Ancistrogastrinae.

The genus *Neolobophora* Scudder⁶ has as its genotype, by monotypy, *N. bogotensis* Scudder, based on a single female from Bogotá, Colombia. While recorded more than once by later authors it would seem, as elaborated below, that the species has remained virtually unrecognized until the present time.

While I was engaged in the present study Mr. Hebard placed in my hands two remarkable male Neolobophorine specimens

⁵ Trans. Amer. Entom. Soc., XLV, pp. 95-96, (1919).

⁶ Proc. Boston Soc. Nat. Hist., XVII, p. 281, (1875).

from Muzo, Boyacá, Colombia.⁷ These individuals possessed very elongate, slender, simple forceps, and were in every way quite different from anything seen previously. Efforts to locate then invariably led me to *Neolobophora bogotensis*, the original description of which was discouragingly indefinite about features which might have assisted in the recognition of the opposite sex. A call for help to Dr. Nathan Banks, at the Museum of Comparative Zoology, elicited some very useful notes made from the unique type of Scudder's *bogotensis*. These critical observations are sufficiently convincing to demonstrate that the Muzo insect is the previously unknown male of Scudder's species.

It is evident from the Muzo individuals of *bogotensis* that the erection of two new genera is necessary, one to accommodate the "*Neolobophora*" *ruficeps* of the literature of recent decades, and the other to include the insect recorded as *Neolobophora bogotensis* by Bormans from Central America. Hebard's genus *Neocosmiella*⁸ is the closest relative of true *Neolobophora*, as one might expect from its geographic propinquity, but it differs in certain features which might be tabulated as follows:

<i>Neolobophora</i> (On basis of male sex)	<i>Neocosmiella</i> (Male sex only known)
Antennae with second, third and fourth joints together subequal to proximal joint.	Antennae with second, third and fourth joints together one and one-third times as long as proximal joint.
Tegminal keel at humeral angle distinct, but not carinately elevated, becoming obsolete at distal fourth.	Tegminal keel at humeral angle very marked, carinately elevated, becoming obsolete at distal fourth.
Surface of tegmina apparently smooth to the naked eye, minutely shagreenous under considerable magnification.	Surface of tegmina coarsely acco-punctate, visible to the naked eye.

These two groups are unquestionably developments from a common ancestor, but their features of difference appear to warrant generic separation. When the female sex of *Neocosmiella* is known, and the tarsal structure of the two genera is compared, we will be in a better position to discuss more critically their affinity. The unique type of *Neocosmiella* now lacks complete tarsi.

⁷ VIII, 1921, (A. Mariu), [Hebard Collection].

⁸ Trans. Amer. Entom. Soc., XLV, p. 95, (1919).

RHYACOLABIS⁹ new genus

This interesting genus shares certain features with *Neolobophora* and others with *Neocosmiella*, to both of which it is related. From these two genera, however, it differs in the surface of the abdomen being hirsute, the tegminal keel complete and the pronotum weakly transverse. From *Neolobophora*, *Rhyacolabis* also can be distinguished by the tegminal keel being strongly developed, carinately elevated, instead of moderately evident and not carinately elevated, while it agrees with *Neolobophora* in having the surface of the tegmina minutely shagreenous when seen under a strong lens, and apparently smooth to the naked eye. From *Neocosmiella* the new genus readily can be distinguished by the tegmina having their surface as above, and not coarsely coriaceous-punctate, as well as in the lateral portions of the pronotum being broad and greatly encroaching upon the disk mesad, instead of narrow and subequal, as in *Neocosmiella*.

In the absence of the male sex of *Rhyacolabis* it may seem hazardous to describe the insect as a new genus, but as the species on which it is founded has been figured and reported for many years, and the differences appear, from our knowledge of allied genera, to be of considerable importance, no other course is open. This is clearly evident when it is realized that to attempt to fit it in either of the other genera would do violence to their cohesiveness.

Linearly arranged the genera of this assemblage, which we have had to examine in connection with our Costa Rican study, would stand as follows: *Rhyacolabis*, *Neocosmiella*, *Neolobophora* and *Metresura*. The genus *Rhyacolabis* has a facies which is appreciably Ancistrogastrine. The African genus *Archidux* Burr¹⁰ is apparently a near relative of *Rhyacolabis*, having a complete humeral tegminal keel, but it has the abdomen smooth and the limbs elongate, while doubtless other important features would be found to exist on comparison. *Archidux* has a pronotum and limb development much as in *Neolobophora* and *Neocosmiella*, while its general facies suggests *Metresura*, but the head structure alone prevents confusion with the latter genus.

⁹ From ρύαξ *volcano*, and λαβίς *forceps*.

¹⁰ Ann. and Mag. Nat. Hist., (8), iv, p. 124, (1909).

Generic Description. - Head short and broad, with twin impressions between eyes; occiput uninflated, sutures faint. Pronotum subquadrate, narrowly transverse, weakly narrower than width across base of tegmina; lateral areas broad. Tegmina abbreviate, attingent, subobliquely truncate distad; humeral keel prominent, carinately elevated, continuous; surface of tegmina minutely shagreenous under magnification. Wings not evident. Abdomen with stink glands of third tergite weakly developed, those of fourth tergite strongly developed; sides of tergites simple; disto-dorsal tergite of female simple; subgenital plate of female ample; surface of abdomen and forceps with a thin but regularly distributed clothing of adpressed golden hairs.

Genotype. *Rhyacolabis anachoreta* new species.

Rhyacolabis anachoreta¹¹ new species (Plate XVII, figures 2 and 3.)

1893. *Neolobophora bogotensis* Bormans, Biol.-Cent.-Amer., Orth., 1, p. 8, pl. II, fig. 9. [♀; "Volcan de Irazu, 6000 7000 feet, Costa Rica; Volcan de Chiriqui, 2500 to 1000 feet, Panama."] (Not *Neolobophora bogotensis* Seudder, 1875.)

1900. *Neolobophora bogotensis* Bormans, Das Tierreich, XI, p. 100. [♀; "Costa Rica am Vulkan von Irazu, in 1830-2130 m. Höhe, Panama am Vulkan von Chiriqui, in 760 1200 m. Höhe."] (Not *Neolobophora bogotensis* Seudder, 1875.)

The figure given by Bormans in the Biologia will greatly assist in the recognition of this previously misunderstood species. The character of the pronotum, the general form of the tegmina, the position and indication of their humeral keel, and the general proportions are all shown sufficiently well to make the figure of real use. Although the type is a female I feel less hesitation about describing it than would be the case if we had no previously published information.

Type. - ♀; Volcano of Irazu, Costa Rica. February 22, 1902. (M. Cury.) [Hebard Collection, Type no. 782.]

Size rather small; form broad, depressed; surface of sterna, abdominal tergites and sternites, subgenital plate, forceps and limbs well clothed with short hairs, these erect on sterna, moderately or distinctly depressed elsewhere.

Head broad, very slightly broader across eyes than greatest length, post-ocular portion of head very faintly longer than eyes, latero-caudal angles very broadly rounded; occiput with its surface bearing a very slight deplana-tion mesad, but otherwise smooth, with sutures distinctly but delicately indicated, and not at all impressed.

¹¹ A *hermit*--in allusion to its isolated habitat and hairy covering.

Pronotum broader than long; cephalic margin truncate; latero-cephalic angles narrowly rounded; lateral margins subparallel, arcuato-truncate; latero-caudal angles rounded obtuse; caudal margin broadly arcuate. Surface of disk in section gently arcuate, with an impressed median sulcus in cephalic half, followed at caudal two-thirds by a median circular pit-like depression, paired circular depressions placed in middle of lateral halves of cephalic section of disk; mesad the disk is narrowed by extension of lateral areas, which widen regularly caudad to this point of greatest width, where they individually constitute one-fifth of total pronotal width, then by a pronounced meso-lateral directed oblique definition, become obsolete. Lateral areas very appreciably reflexed dorsad.

Tegmina with greatest length equal to one and one-fourth times greatest length of pronotum, seen from dorsum the pair slightly and regularly broaden caudad, except in distal fourth, where the humeral carinae are subparallel when tegmina are in normal position; sutural margins in contact for greater portion of their length, exposing scutellum proximad; distal margin truncate, but little oblique, nearly transverse; humeral keel carinate, elevated, pronounced, continuous; costal margin straight for proximal two-thirds, in distal third arcuate to keel; marginal field with width equal to slightly more than one-fourth of length of same.

Abdomen broad, short fusiform. Disto-dorsal tergite rather small, symmetrically trapezoidal; surface moderately depressed meso-distad. Subgenital plate very ample, scoop-shaped, its free margin broadly arcuate with faint median flattening. Forceps simple, tapering, tips moderately hooked and weakly recurved, internal margin serrulate; surfaces striatulate, particularly along dorso-internal section.

Limbs largely damaged or missing. Cephalic limbs short and robust.

General color deep bay on the dorsum of abdomen, becoming Dresden brown to auburn on venter, tegmina, disk of pronotum and head, latter pale on occiput. Lateral areas of pronotum pale chamois. Forceps pale ochraceous-tawny. Remaining limbs ochraceous-buff.

Length of body (exclusive of forceps) 8 mm.; length of pronotum, 1.35; greatest width of pronotum 1.6; length of tegmen, 1.68; greatest width of tegmen, 1.09; length of forceps, 2.25.

In addition to the type we have before us an immature specimen of small size, bearing the same data.

METRESURA¹² new genus

From *Neolobophora* and *Rhyacolabis* this genus is readily distinguishable by the inflated and divided occiput, the small eyes and the tegmina being without true humeral keels. As is the case with *Neolobophora*, *Metresura* also differs from *Rhyacolabis* in the broad disk and narrow lateral sections of the

¹² From *μετρέω* measuring and *οὐρά* tail, in allusion to the divider-like forceps of the male.

pronotum, the non-hirsute abdomen and elongate and slender limbs. From *Neocosmiella* Hebard the new genus differs in the inflated and divided occiput, small eyes, and in the absence of true tegminal keels, while the male forceps also lack the prominent tooth found at the proximo-lateral base in *Neocosmiella*.

Generic Description.—Head broad cordiform; occipital sutures distinct, occiput weakly or distinctly bullate; postocular portion of head longer than eyes. Pronotum subquadrate, lateral margins subparallel; latero-cephalic angles rectangulate, at most but narrowly rounded; caudal margin moderately arcuate; disk of pronotum broad, weakly arcuate transversely; median sulcus distinct cephalad; lateral ascending sections very narrow. Tegmina brief, little longer than pronotum; distal margin obliquely concavo-truncate; juncture of horizontal dorsal and vertical lateral sections of tegmina without true keel. Wings not evident. Abdomen with third and fourth tergites with well-developed lateral folds, that on fourth larger; surface of abdomen punctulate, polished. Forceps of male slender, elongate, not contiguous at the base, with at least one tooth near median section, apices incurved. Forceps of female simple, attenuate, apices narrowly incurved. Pygidium of male distad simple or bispinose. Limbs elongate.

(Genotype.—*Metresura ruficeps* (Burmeister) [*Forficula ruficeps*].)

In addition to the genotype, *Metresura* contains at least two species which have been referred to *Neolobophora*, and which should be removed from the latter—*borellii* Burr and *insolita* Borelli. Of the former material is now before us,¹³ and the latter is clearly a member of the same generic unit. Several other species have been referred to *Neolobophora* which we have not been able to examine. The African genus *Archidux* Burr shows distinct relationship to *Metresura* on one hand and the restricted *Neolobophora* complex on the other. From *Metresura*, however, it can be distinguished by the non-impressed head sutures and uninflated occiput, as well as the possession of complete and apparently well indicated humeral tegminal keels. Burr's *borellii* has the occipital inflation less marked than in *ruficeps*, and the tegmina are more sharply folded proximad at the

¹³ See Hebard, Trans. Amer. Entom. Soc., XLIII, pp. 425-526, (1917).

humeral angle than in the latter species, but there can be no confusion with the very smooth head and completely keeled tegmina of *Neolobophora*.

ANCISTROGASTRINAE

Paracosmia carrikeri new species (Plate XVII, figures 1, 5 and 6.)

A striking member of the genus, more nearly related to *P. gulosa* (Scudder) and *silvestrii* Borelli than to the other species which have been referred to the genus. From *gulosa*, with a male paratype of which the new form has been compared,¹¹ *carrikeri* is seen to differ chiefly in its more elongate, attenuate form; in the head being more elongate cordiform; the pronotum proportionately narrower, being appreciably narrower than the head, and the lateral margins nearly straight, faintly convergent caudad; the abdomen elongate fusiform; in the fifth and sixth dorsal abdominal segments being without lateral carinae; in the ultimate dorsal abdominal segment having the lateral margins weakly convergent caudad, instead of subparallel; in the more elongate and distad attenuate forceps, which are straighter in profile, with the apices more falcate and without as marked a predistal "bite" as found in *gulosa*; in the angulate emargination instead of truncate median emargination of the penultimate ventral abdominal segment, and in the elongate, attenuate limbs. From *silvestrii* Borelli the new form differs in the same features as from *gulosa*, except that the ultimate dorsal abdominal segment agrees in shape in *silvestrii* and *carrikeri*, and in *silvestrii* the tegmina are short and the wings not evident, while in *carrikeri* these are as in *gulosa*. Hebard¹² already has suggested that *gulosa* and *silvestrii* may represent forms of the same species, which appear to us to be quite probable.

No comparison is necessary with the other species which have been referred to *Paracosmia*, or any species which have been assigned to related genera.

Type.—♂; Turrialba, Costa Rica. (M. A. Carriker, Jr.) [Hebard Collection, Type no. 212.]

Size moderately large; form subdepressed; surface smooth but dull.

Head subelongate cordiform, slightly longer than broad, width across eyes faintly greater than caudad of same; caudo-lateral angles broadly rounded;

¹¹ See Hebard, Trans. Amer. Entom. Soc., XLIII, p. 128, (1917).

¹² Vide supra.

occipital margin very slightly and broadly emarginate; sutures distinctly but shallowly marked; proximal antennal joint conico-cylindrical, greatly elongate, one and one-half times as long as greatest length of eye; second joint minute; third joint not quite half length of first; remainder missing.

Pronotum with length subequal to width, latter less than that of head; cephalic margin slightly oblique-truncate laterad, latero-cephalic angles narrowly rounded, lateral margins faintly arcuate, faintly converging caudad, broadly rounding into the caudal margin, which is well arcuate with the faintest possible median angle; disk of prozona considerably elevated, with a distinct medio-longitudinal sulcus, laterad of which is placed on each side a single impressed puncture; metazona depressed, with a slight but distinct median carina, lateral portions considerably reflexed dorsad.

Tegmina twice as long as pronotum, broad, their combined width almost twice that of pronotum; latero-cephalic angles very well rounded, when viewed from dorsum the lateral margins are seen to be slightly converging caudad; tegmina carinate throughout their length; caudal margin slightly oblique, weakly concave. Wings with exposed portion slightly shorter than length of pronotum, arcuate laterad, their apices squarely truncate.

Abdomen subfusiform in outline; third and fourth segments bearing distinct lateral plicae, those of fourth segment the larger; laterad the dorsal segments have their caudal margins weakly angulate produced caudad, those non-carinate. Penultimate dorsal abdominal segment subrectangulate, transverse, greatest length contained one and one-half times in its greatest width, lateral margins slightly converging caudad; surface of segment with a faint median sulcus succeeded caudad by a small median pit near the caudal margin, latter very slightly but broadly arcuate between the bases of the forceps; lateral angles of penultimate dorsal abdominal segment well recurved beneath the forceps, with two spines of which the caudal (and also apical) one is the larger. Forceps moderately elongate, enclosing an elongate pyriform area, the anus distinctly but not greatly depressed; base on internal side with a large blunt shoulder-like projection, thence moderately arcuate and converging to the considerably recurved and falciform tips; no teeth present but internal margin crenulate for almost its entire length, the pre-apical angle found in many *Ancistrogastri* forms being represented by an obtuse angle. Penultimate ventral abdominal segment broadly obtuse-angulate emarginate, with lateral angles produced into short acute projections, lateral margins of the segment converging caudad, the whole plate decidedly transverse. Limbs elongate and very slender; caudal metatarsus slightly exceeding the third tarsal joint in length.

General color bay, the tegmina and exposed portion of the wings largely vandyke brown. Head, aside from the labrum, clypeus and eyes, burnt sienna; clypeus vandyke brown and labrum marked with same; eyes seal brown; two proximal antennal joints seal brown, the third tawny-olive. Pronotum vandyke brown mesad, bordered laterad on the prozona with clear chestnut, the whole broadly margined laterad with clear ochraceous. Tegmina with a poorly defined premedian spot and a wash at the latero-cephalic

angle, ochraceous-rufous. Forceps similar to the abdomen in color. Femora with proximal portion distinctly ochraceous, the remainder seal brown; tibiae ferruginous.

Length of body (exclusive of forceps), 13.3 mm; length of pronotum, 1.8; greatest width of pronotum, 1.9; length of tegmen, 3.6; length of forceps, 5.8.

The type of this most interesting species is unique. It is with the greatest of pleasure that we dedicate this species to its collector, M. A. Carriker, Jr., a friend of many years, a most genial and delightful companion, and a splendid naturalist in the field and in the laboratory.

EXPLANATION OF PLATE XVII

Fig. 1.—*Prolabia calverti* new species. Dorsal view of forceps and pygidium of male (*type*). (Greatly enlarged.)

Fig. 2.—*Rhyacolabis anachoreta* new genus and species. Dorsal outline of head, pronotum and tegmina of female (*type*). ($\times 9$)

Fig. 3.—*Rhyacolabis anachoreta* new genus and species. Lateral outline of tegmen of female (*type*). ($\times 9$)

Fig. 4.—*Paracosmia carrikeri* new species. Dorsal view of male (*type*). ($\times 3$)

Fig. 5.—*Paracosmia carrikeri* new species. Outline of venter of apex of abdomen, with base of forceps, of male (*type*). ($\times 6$)

Fig. 6.—*Paracosmia carrikeri* new species. Outline of lateral aspect of apex of abdomen, with base of forceps, of male (*type*). ($\times 6$)

THE JANEIRENSIS GROUP OF THE GENUS EUBORELLIA,
WITH THE DESCRIPTION OF A NEW SPECIES
(DERMAPTERA)

BY MORGAN HEBARD

While at Miami, Florida, early in 1919, the author again visited the mangrove swamp on the border of Brickell's Hammock, for the purpose of securing additional material of several interesting species of Orthoptera which, in 1915, had been found therein,—i. e. *Ilygromobius alleni* (Morse), *Anaxipha scia* Hebard and *Anaxipha imitator* (Saussure.)¹ While searching for specimens of the second species, about the mangrove shoots which projected from the muck and tidal litter, some of the latter was overturned and a specimen of *Euborellia* revealed. This individual soon was seen to be different from *annulipes* (Lucas), the only species of the genus hitherto known from the United States, and vigorous efforts were vainly made to find other examples. Several days later the spot was revisited and yards of the litter carefully lifted and sifted. Flours of such work resulted in our securing five males, three females and several immature specimens of the species. These were found under seaweed and sea-grass, drifted in to the edge of the normal high tide, usually between the lower matted layers, near the wet, mucky ground. The species was local, but never in colonies, as is usual for *Anisolabis maritima* (Génot), two specimens of which were found in the same place. The area in which the species occurred is shown in the accompanying illustrations (pl. XVIII, figs. 1 and 2).

Comparison of this material with a female of *Euborellia ambigua* (Borelli),² from Santa Maria de Dota, Costa Rica, shows full agreement. Further comparison of material convinces us that the West Indian series, recorded by Rehn and Hebard as *E. ambigua*, represents a distinct, though very closely related, species.

¹ Recorded in Ent. News, xxvi, pp. 463, 465 and 466, (1915).

² Recently received from Borelli, in exchange, by the Academy of Natural Sciences of Philadelphia.

These species, with the South American *Euborellia jancirensis* (Dohrn), show a distinctive type of tegminal development, in which the aborted rounded tegmina cover all of the mesonotum except the small median scutellar area, or all but a narrow median portion of the mesonotum. We refer them to what we term the Jancirensis Group. This type of tegmina in some respects resembles that developed in the Indian species *Paralabis castetsi* (Bolivar) and *Epilabis penicillata* (Borelli). Those species, however, have the tegmina much more transverse, with cephalic margins parallel to, and separated a distance from, the caudal margin of the pronotum, so that a narrow cephalic marginal portion of the metanotum is exposed, giving the appearance of a very broad, but shallow, scutellar area.

In order to avoid further confusion, we give, in the accompanying key, the more striking features of difference between the American species under consideration, following them with such additional data as is considered of value.

Key to the Species of the Jancirensis Group

A. Seventh to ninth abdominal tergites of male with latero-caudal angles sharply acute-angulate produced, weakly keeled and weakly rugulose. (Eighth and ninth abdominal tergites of female with latero-caudal angles roundly angulate produced, showing weak traces of keels distad.) Male forceps more distinctly bowed, as in *Euborellia moesta* (Géné) or the type of extreme specialization developed in *annulipes*; female forceps longer and more slender. Limbs unicolorous. (Antennae not annulate.) Caudal metatarsus no longer than combined length of the succeeding tarsal joints. (Size averaging large³, 12.7⁴ to 14⁵ mm.). (Southern Florida and Costa Rica.)

ambigua (Borelli)

AA. Sixth to ninth abdominal tergites of male with latero-caudal angles very sharply acute-angulate produced, distinctly keeled and rugose. Male forceps weakly bowed, as is usual in *annulipes*; female forceps shorter and heavier. Limbs not unicolorous. Caudal metatarsus slightly but distinctly longer than combined length of succeeding joints.

³ Unless qualified the length given by us for Dermaptera is always that of the body, exclusive of the forceps.

⁴ This is from the Costa Rican specimen before us; all of the Florida individuals are larger.

⁵ A body length of 16 millimeters is given in the original description.

B. Antennae not annulate. Eight and ninth abdominal tergites of female with latero-caudal angles rounded and rarely showing any trace of keel. Femora with external faces broadly washed with brown, this often weak; internal faces similarly washed with brown, this weaker and less extensive. Tibiae with ventral surface normally very weakly tinged with brown; this, when conspicuously developed, extending to near distal extremity. Size averaging small, 8.2 to 11.7^b mm. (West Indies.)

caralbea new species

BB. Antennae annulate. Eighth and ninth abdominal tergites of female with latero-caudal angles roundly angulate produced and showing very weak keels. Femora with median portion of external faces suffused with brown, corresponding portion of internal faces usually with a suffused patch of this color. Tibiae weakly tinged with brown proximad. Size averaging larger, 11.5 to 12.5 mm. (South America.)

janeirensis (Dohrn)

Euborellia ambigua (Borelli) (Plate XIX, figures 1, 2 and 3.)

1906. *Amsolabis ambigua* Borelli, Boll. Mus. Zool. Anat. comp. Univ. Torino, XXI, no. 531, p. 3. [♀: Rio Jesus Maria, in mangrove region, Costa Rica.]

Santa Maria de Dota, Costa Rica, 1 ♂, [A. N. S. P.].

Brickell's Hammock, Miami, Florida, II, 28 and III, 6, 1919, (M. Hebard; in mangrove swamp), 5♂, 3 ♀, 1 juv., [Hebard (In.).]

The hitherto unknown male sex of this species may be readily recognized by the figures and the characters given in the key. In ambisexual features it agrees closely with Borelli's adequate description of the female. We would note, however, that the pronotum, though widening evenly caudad, is there not as wide as the width of the head across the eyes. Borelli has stated "Pronoto . . . posteriormente di larghezza uguale a quella del capo."

At the coastal localities where it has been found the species is known only from mangrove swamps. It will probably be found to have a wide distribution in that environment, when such situations, difficult of access and usually harboring swarms of mosquitoes, have been more extensively and carefully examined.

^b Length of body, including forceps, of this largest specimen, from Porto Rico, 13.5 mm.

Euborellia carai-bea new species (Plate XIX, figures 1, 5 and 6.)

1917. *Euborellia ambigua* Rehn and Hebard (not *Anisolabis ambigua* Borelli, 1906), Bull. Am. Mus. Nat. Hist., xxxvii, p. 638 [♀, ♂; Nassau, New Providence Island, Bahamas; Jesús del Monte, Cuba; Stony Hill and Montego Bay, Jamaica; Roseau, Dominica]

Previous to the records noted above, incorrectly referred to *ambigua*, material of the species had been recorded at different times as *annulipes* and *janeirensis*. Specimens of *carai-bea* from Porto Rico are in the Philadelphia Collections, while Borman's record of *janeirensis* from St. Vincent⁷ is almost certainly referable to this species.

The most important features of difference between *carai-bea* and its nearest allies are given in the accompanying key, and are shown by the figures. The following additional characters are noteworthy.

Type.—♂; Nassau, New Providence Island, Bahamas. February 3, 1914. (M. Hebard.) [Hebard Collection, Type no. 776.]

Form moderately stout, as in *janeirensis*, slightly heavier than in *ambigua*. Antennae with longest distal joints not over twice as long as wide, in *janeirensis* about two and one-half times as long as wide, in *ambigua* fully three times as long as wide. Pronotum with length equal to width as in *janeirensis*, slightly shorter than in *ambigua*. Abdomen generally impresso-punctulate, this slightly heavier than in *janeirensis*; in *ambigua* the abdomen is almost smooth, showing much finer impressed punctulations laterad and distad.

Ultimate abdominal tergite with a distinct, impressed, medio-longitudinal line; the surface slightly more tumid laterad than in *janeirensis* and *ambigua*. Forceps much as in males of *janeirensis*; short, stout, triquetrous proximad, straight to the incurved apices, the sinistral arm being less strongly incurved distad than the dextral arm, internal margin bluntly subserrulate. Penultimate abdominal sternite triangularly produced, with apex rather broadly truncate.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with male in features given above, except as follows. Ultimate abdominal tergite showing weak convexity dorso-laterad. Forceps much as in females of *janeirensis*; shorter than in male, stout, triquetrous proximad, straight to the weakly incurved apices, the sinistral and dextral arms being incurved to an equal degree, the nearly attingent ventro-internal margins slightly more coarsely but as bluntly subserrulate as in male.

The measurements of the type and allotype are as follows. Length of body, ♂ 10.2, ♀ 10.3; length of pronotum, ♂ 1.43, ♀ 1.56; caudal width of pronotum, ♂ 1.43, ♀ 1.56; length of tegmen, ♂ 1.16, ♀ 1.29; width of tegmen,

⁷ Proc. Zool. Soc. London, 1892, p. 201, (1892).

♂ .88, ♀ .98; length of forceps, ♂ 1.9, ♀ 2.24; greatest (proximal) width of arm of forceps, ♂ .79, ♀ .85 mm.

General coloration shining, blackish with an auburn tinge. Antennae auburn, the proximal joints very slightly paler. Limbs warm buff, marked as described in key.

In addition to the type and allotype, a pair bearing the same data, in the Hebard Collection, and a female, from the same locality, taken in the spring of 1904, by W. M. Wheeler, in the Academy of Natural Sciences Collection, are designated paratypes.

The following previously unrecorded material is before us:

Cape Haitien, Hayti, (W. M. Mann), 1 ♀, [Mus. Comp. Zool.].

Momance, Hayti, XI, 1912, (W. M. Mann), 1 ♀, [Hebard Cln.].

St. Marc, Hayti, I, 1913, (W. M. Mann), 1 ♂, [Mus. Comp. Zool.].

Arecibo, Arecibo, Porto Rico, VII, 30 to VIII, 1, 1914, (Lutz, Mutchler, Watson; under bark of rotten stump and under logs), 1 ♂, 1 ♀, [Acad. Nat. Sci. Phila.].

Utua, Arecibo, Porto Rico, (W. M. Wheeler), 1 ♂, 3 ♀, [Amer. Mus. Nat. Hist.].

Baños de Coamo, Ponce, Porto Rico, (W. M. Wheeler), 1 ♂, 2 ♀, 3 juv., [Amer. Mus. Nat. Hist.].

Aibonito, Ponce, Porto Rico, VI, 1 to VII, 17, 1914 and 1915, (Lutz, Mutchler, Barber; in rotten logs), 1 ♂, 2 ♀, [Amer. Mus. Nat. Hist.].

Port of Spain, Trinidad, III, 4, 1910, 1 ♂, [Acad. Nat. Sci. Phila.].

The last is the southernmost locality known for the species.

***Euborellia janeirensis* (Dohrn)**

1864. *F[oreinella] janeirensis* Dohrn, Stettin Ent. Zeit., xxv, p. 285. [♂; Rio de Janeiro, Brazil.]

Two males and three females from Ceará Mirim, Rio Grande do Norte and Independencia, Parahyba, Brazil, correctly recorded as this species by Rehn,³ have been used as the basis for the comparisons made in the present paper.

³ Trans. Am. Ent. Soc., XLII, p. 218, (1916).

EXPLANATION OF PLATES

Plate XVIII

Mangrove swamp on edge of Brickell's Hammock, Miami, Florida. Habitat of *Euborellia ambigua*, *Hygronemobius alleni*, *Anaxipha scia* and other species.

Fig. 1.—Looking into swamp from seaward border. Tidal litter shown in foreground, beneath which *Euborellia ambigua* occurred.

Fig. 2.—Seaward border of swamp, looking out toward Biscayne Bay from the same spot shown in figure 1. The mangrove shoots shown in the lower right-hand corner were the preferred habitat of *Anaxipha scia*, while beneath the tidal litter at their bases *Euborellia ambigua* was found.

Plate XIX

Fig. 1.—*Euborellia ambigua* (Borelli). Brickell's Hammock, Miami, Florida. Dorsal outline of male. ($\times 3$)

Fig. 2.—*Euborellia ambigua* (Borelli). Brickell's Hammock, Miami, Florida. Lateral view of distal portion of male abdomen. ($\times 4$)

Fig. 3.—*Euborellia ambigua* (Borelli). Brickell's Hammock, Miami, Florida. Dorsal view of distal portion of female abdomen. ($\times 4$)

Fig. 4.—*Euborellia caraibea* new species. Nassau, New Providence Island, Bahamas. Type. Dorsal outline of male. ($\times 3$)

Fig. 5.—*Euborellia caraibea* new species. Nassau, New Providence Island, Bahamas. Type. Lateral view of distal portion of male abdomen. ($\times 4$)

Fig. 6.—*Euborellia caraibea* new species. Nassau, New Providence Island, Bahamas. Allotype. Dorsal view of distal portion of female abdomen. ($\times 4$)

STUDIES IN AMERICAN EPHYDRIDAE (DIPTERA)

BY E. T. CRESSON, JR.

III. A REVISION OF THE SPECIES OF GYMNOPIA AND ALLIED GENERA CONSTITUTING THE SUBFAMILY GYMNOPIINAE.

The species treated in this paper belong to a subfamily which I propose for the reception of *Placopsidella*, *Gymnopia*, *Athyroglossa*, *Ochtheroidea*, and *Cerometopon*. In my classification of the Ephydriidae, this group of genera comes first in the linear arrangement. It is questionable, however, whether these genera are members of the Ephydriidae. They strongly suggest in many respects relationship to members of the Oseiniidae or the Agromyzidae, and this unconformity is largely responsible for placing the group far from *Ephydra* and its allies.

In criticism of the Haliday-Loew classification followed by Becker et al., I have to say that *Athyroglossa* and *Ochtheroidea* are certainly related to *Gymnopia*, not with *Hydrina* or *Ochthera*. Superficially the species of *Ochtheroidea* resemble those of *Hydrina*, but there is no logical similarity to those of *Ochthera*, except in the slightly thickened, spinose fore femora. This thickening is also present in some species of *Discocerina*, which genus belongs to a distinct group. The genus *Placopsidella* is very closely related to *Gymnopia*, and contains, from present knowledge, a single oriental species, *cianocephala* Kertész.

In this subfamily I would also place the genus *Hecamede*. Its position, however, is difficult to determine. But one, a European, species is known.

As stated in the introductory remarks to these studies given in the first paper, I intend to publish a revised classification of the family at the end of the series. These studies of an apparently large, little known family of Diptera, being necessarily preliminary in nature, I will abridge the diagnoses to what seem to be essential characteristics, leaving the more exhaustive descriptions to the monographer.

The material upon which these studies are based is listed in the introduction to my first paper.¹ Since then additional material has been received from the following sources: California Academy of Sciences, [Cal. Ac. Sc.]; Museum of Comparative Zoology, [M. C. Z.]; New York Academy of Sciences, Porto Rico Survey, through Dr. Frank E. Lutz, [N. Y. Ac. Sc.]; United States Department of Agriculture, Biological Survey, [Biol. Surv.]. To these also I extend thanks for the privilege of studying their collections. In cases where no source is given, it is understood that the material is from the collections at the Academy of Natural Sciences of Philadelphia.

Subfamily GYMNOPIINAE

It is certainly advisable to consider the genera here included as representing a distinct subfamily, if they are to be admitted into the Ephydridae. They do not seem to intergrade with any other group, being at once recognizable by the sharp, post-buccal ridge. This ridge is the vertical keel or emargination separating the post-buccal area from the occiput, and extends from the oral margin to near the post-orbits, vanishing there at about on the center line of the eyes. The known species have the following additional characters, which may be considered of subfamily value.

Head subhemispherical; occiput entirely concave. Eyes round or slightly oblique, bare; post-orbits visible in profile. Frons convex in profile, the areas weakly defined; orbits parallel, with the usual vertical bristles; ocelli close, not tuberculate, with post-ocelli removed from the vertex; orbital bristles proclinate when present; no reclinate frontals. Face deeply excavated beneath antennae for its entire width; lower portion, in profile, prominent, convex or tuberculate medianly; parafacialia dilating below into the broad cheeks; the groove distinct; facialia sometimes broad and sculptured, bearing three or more appressed medianly inclined bristles. Cheeks with well developed post-buccal area, but no bristle. Clypeus strongly

¹ Trans. Amer. Ent. Soc., XLII, 101, 1916.

developed, apron-like, projecting and occupying the narrow, emarginated epistoma. Proboscis retractile. Antennae short; second joint with short apical spine. Thorax quadrate, with fore coxae not attaining base of middle ones. Mesonotum rather convex; setulae numerous and irregular, or sparse and serially arranged; one post-dorso-central near base of scutellum, one post-alar, two notopleurals, one or more marginal mesopleurals, one sternopleural. Scutellum broad, with four bristles. Abdomen ovate. Legs rather slender, but fore femora thickened, generally with a post-flexor series of short spines, several of which are sometimes stronger than the others. Wings elongate; costa broad at humeral cross-vein; no cleft at first vein; auxillary vein ending in first near middle of latter; second vein long and straight; third and fourth veins generally parallel. All bristles proportionately short.

There are six genera known to me, four of which, embraced in the scope of this paper, may be separated as follows:

Table of Genera

Alula broad, auriculate (*Gymnopa*).

Face with a median shining tubercle; frontal bristles very weak ***Gymnopa***

Face medianly wrinkled without tubercle; fronto-orbital bristles well developed ***Cerometopon***

Alula narrow, linear

Athyroglossa*, *Ochtheroidea

GYMNOPA Fallen

1820 *Gymnopa* Fallen, Dipt. Suec., Oscin., 10.

1856. *Glabrinus* Rondani, Procl. Ital., 1, 132.

This genus I have considered typical of the present subfamily. Its species are similar to those of *Discocerina* superficially. Both genera are probably old, branching early in their phylogeny. The present genus has been placed in various families by previous authors, showing that they suspected its lack of affinity with recognized Ephydrid groups. By most authors, however, it was considered a Chloropid rather than an Ephydrid. It is probably neither, but is included with its allies in the present paper on account of its apparent relationship with the other members of the Ephydridae.

This genus, as based on its genotype, is fairly well characterized by the weak or undeveloped macrochaetae, the frontals and fronto-orbitals being scarcely discernible even the ocellars and the verticals are very weak. The face is medianly wrinkled or papillose, with a well marked rounded shining tubercle. The arista is bare or pubescent, and the mesonotum and scutellum finely scabrous or granulose, giving them a subopaque appearance; the setulae are numerous and irregular. The alula of the wings is strongly auriculate. Regarding the facial structure and the sculpturing of the mesonotum and scutellum, there are some species of *Athyroglossa* possessing these characteristics, and one or two show considerable recession in the development of the frontal bristles and aristal pectination. Therefore one must be careful in working with such species. A character which seems to be valuable in separating these genera is the development of the alula. This portion of the wing in *Athyroglossa* is very narrow, sometimes scarcely discernible, while in *Gymnopa* it is very broadly lobed.

Genotype.—*Gymnopa aenea* Fallen (1820) = *Syrphus subsultans* Fabricius (1794).

Walker described two species from the United States, which he credited to this genus, but I cannot secure trace of the types in the British Museum, and therefore cannot recognize them. His descriptions, however, apply more to some of the *Psilopini* than to this genus.

These Walkerian species are:

Gymnopa nigroaenea Walker, Dipt. Saund., 413, 1852.

Gymnopa tarsalis Walker, Dipt. Saund., 413, 1852.

Synonymy.—*Gymnopa* as a generic name was used in the present sense until 1864, when Schiner associated Latreille's name *Mosillus* with this group. Loew, in 1870², protested against the use of *Mosillus* on the grounds of sixty years usage of *Gymnopa* and the doubtful meaning of *Mosillus*. Becker held the same opinion. Since 1864, the group has been called by either name, according to the view of the student. The name *Mosillus* first appeared in the literature in 1804, proposed by Latreille.³ Two species are there cited with queries (*Musca*

² Jahrb. Gelehrt. Ges. Krakau, xli, [sep. pagination] 15, 1870.

³ Nov. Diet. Hist. Nat., xxiv, Tab. Meth. 196.

demandata and *M. frit* Fabricius) and a note made referring the genus, as he considered it, to his group "Sombres ou metal-
liques division des *M. vibrantes*." In referring to Latreille's
earlier work⁴, under the division mentioned we find three species
cited: *Musca vibrans*, *frit*?, and *subsultans*? Linnæus. We must
therefore consider *Musca vibrans* the genotype of *Mosillus*
Latreille, 1804. This acceptance would exclude that genus
from the Ephydriidae. Consideration of *Mosillus* as antedating
Gymnopa may be allowed by dating the former from an 1805
reference,⁵ where *Musca arcuatus* Latreille is the included spe-
cies. Study of the descriptions of the 1804 and 1805 references
shows that, although identical they are very different from that
of his "Mouches vibrantes," and from the same division men-
tioned in the Dictionnaire.⁶ The latter evidently refers to the
flies allied to the present *Seioptera vibrans*. It will be seen from
the above analysis that the name *Mosillus* had better be discard-
ed, at least for this genus.

***Gymnopa tibialis* Cresson** (Plate XX, figures 1, 4, and 5.)

1916. *Mosillus tibialis* Cresson, Ent. News, xxvii, 149.

This name was proposed for our American species, which
differs in many respects from specimens of the European *sub-
sultans* examined. Most noticeably is this so in having the
frontal triangle densely granulose or scabrous near the ocelli,
and the tibiae tawny, not black.

Description.—♂, ♀. Black; third antennal joint sometimes, tibiae except
middle of hind pair, tarsi except apices, tawny. Halteres white. Wings
hyaline with milky tinge; veins yellow.

Shining to polished with faint metallic reflections. Cheeks and abdomen
smooth and polished. Frontal triangle setulose, densely and finely punctate,
especially near the anterior ocellus; frontalia smooth and subopaque. Facial
tubercle in profile, conical (fig. 1). Parafacialia, but not cheeks, foveae, the
papillose facialia, and antennae somewhat, silvery. Mesonotum densely
scabrous and sparingly light pruinose, which appears more dense as two
anterior median vittae and irregular lateral areas. Scutellum scabrous and
setulose, the margin with several stout, short bristles besides the usual four.
Second abdominal segment the longest, with a depressed triangular area in
the middle of the dorsum basally; fifth segment triangular, truncate, with a

⁴ Hist. Nat. Crust. et Ins., III, 458, 1802.

⁵ Hist. Nat. Crust. et Ins., XIV, 380, 1805 (An XIII).

⁶ xv, 126, 1803.

densely scabrous, pilose, flattened, ovate area on dorsum near apex; the male with several rounded indentations laterally near base. Fore femora thickened, spinose beneath, with the proximal spine the longest (fig. 5). All tibiae silvery on outer surfaces. Length.—2.8 to 3.5 mm.

Type.—♂; Wildwood, New Jersey, July 18, 1908, (Cresson), [A. N. S. P. No. 6103].

The above description, in main part, gives only those characters by which this species differs from *subsultans*, as represented by three specimens from Europe, determined, and kindly sent to me, by Prof. Mario Bezzi, of Turin, Italy. I have received specimens from various collections labeled *Gymnopa nana* Walker and *Gymnopa aenea* Fallen. Fallen's name is considered synonymous with *subsultans*. *Ephydra* (*Gymnopa*) *nana* Walker, I do not know, but the description suggests this species. Mr. E. E. Austin of the British Museum, to whom I sent specimens for comparison with Walker's type, reported that the latter is not in the collection there. The sexes are difficult to distinguish. The indentures on the fifth abdominal segment of the male will help in most cases.

Variation.—The examination of a good series of this species shows comparatively little variation. There is some in the extent of the pollinose vesture, the amount of papillose sculpturing on the face, in the amount of milkiness of the wings, and in the color of the tibiae. The scabrous area at the apex of the abdomen is much less confined to the flattened ovate area, and the lateral indentations are usually wanting, in the specimens from Seattle, Washington, and Saltair, Utah. In these the face is nearly denuded of the silvery coating, and the tibiae are darker. Were it not for the sculptured frontal triangle, I would suspect the series to be a closely related form of *subsultans*. A good series of that species may show variations which will endanger the validity of the present one.

Synonymy.—*Gymnopa nigroaenea* and *tarsalis* of Walker are unrecognizable from the descriptions, but suggest *Psilopa* rather than *Gymnopa*. The types cannot be located in the British Museum.

Material Examined.—194 specimens.

CANADA: Nelson, British Columbia, July 17, [Wash.].

MASSACHUSETTS: Cohasset, September 8, (O. Bryant), [B. S. N. II.].

NEW YORK: Cold Spring Harbor, Long Island, July, [Wash.]. Oak Island, Long Island, July, [Wash.]. Sea Cliff, (N. Banks), [Banks].

NEW JERSEY: Riverton, September to October, (C. W. Johnson), [H. N. M.]. Cramer Hill, August 24, (C. W. Johnson), [Johnson]. Wildwood, July 18, (Cresson).

PENNSYLVANIA: Swarthmore, June 13, (Cresson).

MARYLAND: Chesapeake Beach, June to July, (R. S. Shannon), [U. S. N. M.]; September 18, (N. Banks; salt marsh), [Banks].

VIRGINIA: Falls Church, (N. Banks), [Banks]. Potomac Creek, May 22, (C. W. Johnson), [Johnson].

GEORGIA: Tybee Island, August, 26, [Cornell].

FLORIDA: Bradentown, March, (M. C. VanDuzee), [VanDuzee]. Punta Gorda, November 11, [A. M. N. II.].

TEXAS: El Paso, April 5, (Viereck and Rehn). Galveston, April to June, [Wash.].

WYOMING: Sheridan, July, (C. W. Metz), [Wash.].

UTAH: Saltair, July, (J. M. Aldrich).

ARIZONA: Bill Williams Fork, August, (F. H. Show), [Kans.]. Squaw Springs, July 24, [Wash.].

WASHINGTON: Almotu, June 24; Dungeness, August 24; Glenwood, Klickitat River, June 27; Kumiak Butte; Kennewick, June 7; Olga, July 26; Quileene, August 6; Yakima; (all A. L. Melander), [all Wash.].

CALIFORNIA: Anaheim, Orange County, September 23, [Cal. U.]. Berkeley Hills, April 20, (Cresson). Los Angeles County, March 21 to April 1, (M. C. VanDuzee), [VanDuzee]. Monterey County, July 23, [Wash.]. Olancha, June 5, (C. L. Fox), [Cal. Ac.]. Redlands, (F. R. Cole), [M. C. Z.]. Redondo, Los Angeles Co., May 23; Rivera, June 17; [all Wash.]. San Diego County, December 12 to May 8, (M. C. Van Duzee), [Van Duzee]. San Francisco, Golden Gate Park, August 7, to January 5, [Cal. U.].

YUCATAN: Progreso, December 11, [U. S. N. M.].

BERMUDA ISLANDS: July 20, (Trevor Kincaid), [Johnson].

ATHYROGLOSSA Loew

1860. *Athyroglossa* Loew, Neue Beitr., vii, 12.

For sometime I was at loss for characters by which this genus could be definitely separated from *Gymnopa*. For there are quite a number of characters common to, or are similar in, both genera. It was difficult to decide what characters could reasonably be considered generic. The development of the bristles and aristal pectinations seem to be variable, as well as the arrangement of the mesonotal setulae. Finally a few characters were found which seem to hold, and clear up the situation considerably. The face in this genus is not so deeply excavated beneath the antennae and the lower portion is more

convex, without distinctly defined tubercles, with the sculpturing confined to the narrow facialia near the bristles; the alula are linear or very narrow, not auriculate.

On the other hand, the separation of *Ochtheroidea* is not so easily defined. In fact it is a question whether the two are distinct. However, the two species in our fauna have all the tibiae and their halteres black, and the arista short haired above. None of the known species of *Ochtheroidea* have this combination of characters.

Generic Diagnosis.— In general build similar to *Gymnopa*. Eyes slightly oblique elongate; vertex sharp and arcuate. Ocellars situated beyond line of anterior ocellus; proclinate orbital well developed; reclinate frontal distinct. Frons usually broader than long; lunule slightly depressed. Face with median area below subtuberculate to convex; facialia, generally, not defined mesally, with three or more appressed bristles or hairs emitted from minute pits close to the para-facial groove; para-facialia narrow above, the groove continuing to the post-buccal ridge. Arista short haired above. Fourth abdominal segment the longest; fifth short. Alula of wings narrow, not produced beyond the cleft, with long cilia.

Genotype.—*Notiphila glabra* Meigen (1830). [Monotypic.]

The two forms occurring within our fauna seem also to be European species, and may be distinguished as follows:

All tibiae entirely black.

Halters white

.. *Ochtheroidea centralis*

Halters black.

Mesonotal setulae irregular; scutellum scabrous, flattened . . . *glabra*

Mesonotal setulae seriated; scutellum smooth, convex . . . *ordinata*

Only fore tibiae entirely black (see *Ochtheroidea*).

Athyroglossa glabra Meigen (Plate XX, figure 2.)

1830. *Notiphila glabra* Meigen, Syst. Besch., vi, 69.

1860. *Athyroglossa glabra* Loew, Neue Beitr., vii, 12.

In comparing our material with specimens of *glabra* from Europe, I find very little differentiation. There may be slightly more sculpturing and the females are always more shining than the males in our specimens. The species seem to be well distributed.

Description.—♂, ♀. Entirely shining black, with frons and mesonotum, especially of male, somewhat granulose and lightly brownish pruinose, appearing somewhat brassy. Halteres black. Wings hyaline. All tarsi, except apices, whitish yellow; face with upper concavity and orbits somewhat hoary.

Face with four bristles interspersed with fine hairs; lower median portion transversely, subconically convex (fig. 2), and rather irregularly rugulose. Cheeks about one-half height of head, noticeably decending at the post-buccal ridge. Antennae situated on line with center of eyes, slightly above that of head; third joint longer than second; arista with five to six moderately long hairs.

Mesonotal setulae scattered, not serially arranged, and are more numerous in male than in the female. Scutellum scabrous and setulose, only slightly convex in the female; apical bristles with minute tubercles at their bases. Fore femora with only faint indications of flexor spines. Length.—3 mm.

Type.—Described from specimens in the Winthem Collection, now at Vienna. Inhabiting Europe.

Material Examined.—8 ♂, 3 ♀.

NEW YORK: Beavertkill, Sullivan County, August 5-12, (Cresson). Ithaca, May 17, [Cornell].

IDAHO: Pottsville, August 23, (A. L. Melander), [Wash].

WASHINGTON: Almoda, June 24; Ripa, April 8, (all A. L. Melander), [all Wash.].

OREGON: Eagle Creek, Forest Reserve, July 1, (A. L. Melander), [Wash.].

CALIFORNIA: Lagunitas Canyon, Marin Co., March 29, (Cresson).

***Athyroglossa ordinata* Becker**

1896. *Athyroglossa ordinata* Becker, Berl. Ent. Zeit., xli, 135.

My material agrees so well with the description of this European species there is nothing more to do than consider the determination as correct, although not without reluctance. That it is congeneric with *glabra* may also be doubted, in that the mesonotal setulae are few and distinctly seriated, but this character shows the same variation in *Ochtheroidea*.

Description.—♂, ♀. Similar to *glabra*, but smaller, generally smoother and more polished, without any trace of pollinosity. Upper part of the face polished, and with only two bristles besides the smaller hairs in the same series. Oral margin not oblique in profile, but emarginated at the epistoma. Cheeks about one-fourth height of head, not descending at occiput. Antennae situated lower in relation to the eyes. Arista with five to six very short hairs.

Mesonotum polished, with few setulae arranged in six distinct median rows, becoming more scattered laterally. Scutellum more convex than in *glabra*, not at all scabrous, and without tubercles. Abdomen polished. Legs

shining black, with basal joints of fore tarsi yellow; no trace of femoral spines. Length.—1.4 to 2.4 mm.

Type.—♀; Orsova, Hungary, [Becker Collection].

Material Examined.—13 specimens.

NEW HAMPSHIRE: Cornish, July 13 (C. W. Johnson), [B. S. N. H.].

VERMONT: Lyden, June 13, [Wash.].

NEW YORK: Beaverkill, Sullivan County, August 6, (Cresson).

NEW JERSEY: Trenton, July 4, (H. S. Harbeck).

MARYLAND: Plummer's Island, April 12, (W. L. McAtee), [Biol. Surv.].

ILLINOIS: Algonquin, June 1, (W. A. Nason); Urbana, November 21, (on window), [all Illinois].

IDAHO: Moscow, (J. M. Aldrich), [Aldrich]. Potlatch; Priest Lake, August 1, (A. L. Melander); [all Wash.].

WASHINGTON: Glenwood, Klickitat River, June 27; Prosser, May 4; (all A. L. Melander). [all Wash.].

CALIFORNIA: Lagunitas Canyon, Marin Co., March 29, (Cresson). Palo Alto, September 4-5, (J. C. Bradley). [Cornell].

OCHTHEROIDEA Williston

1896. *Ochtheroidea* Williston, Trans. Ent. Soc., London, 1896, 401.

It is very doubtful if this genus is distinct from *Athyroglossa*. It was proposed for the reception of a species which does not show as much differentiation from the type of *Athyroglossa* as do some of the others, which if not included here will have to go under a new genus. This latter treatment is not advisable at present. Were there not an apparent intergradation between the serial and the non-serial arrangement of the mesonotal setulae, one might consider this characteristic of some generic importance. So it may prove to be, especially where in one type the setulae are arranged in well separated series, in contradistinction to the other in which the setulae are more numerous, and at most indistinctly arranged in very close series. However, there seems to be no other characteristics correlated with these two types, and such treatment would throw our *ordinata* out of *Athyroglossa*, probably make *Ochtheroidea* a synonym of *Athyroglossa*, and also make it necessary to erect a new genus for the reception of the first mentioned type of species.

However, after much study of the material before me, containing relative good series from many localities, including the East Indies and Australia, I have concluded to treat *Ochtheroidea* as generically distinct from *Athyroglossa* upon the following characters.

Generic Diagnosis.—Similar to *Athyroglossa*. Ocellar bristles behind or on line with the anterior ocellus, separated from each other as far as the posterior ocelli are from each other. Arista with long hairs above. Fore femora with distinct flexor spines (except in *melanderi*), of which the proximal one is sometimes slightly removed and much stouter than the others. Alula of wings linear with thickened ciliated margin.

Genotype.—*Ochtheroidea atra* Williston, (1896). [Monotypic.]

The facial structure is very variable, from evenly and gently convex to distinctly subtuberculate. In some species the arrangement of the setulae, and the sculpturing of the mesonotum and scutellum, suggests a closer affinity with *Gymnopa* than do the others, but the facial characters offer no correlation. The development of the fore femoral spines is also variable, but in the material examined there is always some indication of such spines.

The sexes in many species are difficult to separate, and I have not attempted to do so. Some of the shining black species of *Discocerina* and its allies may be mistaken for species of this genus, but the development of the post-buccal ridge will at once distinguish those belonging here.

The genus is represented by eight species in the Americas, of which three occur north of Mexico.

Table of American Species

1. All tibiae black.
 - Halteres black.....(see *Athyroglossa*)
 - Halteres white. (Neotropical). *centralis*
 - Only the fore tibiae black... 2
2. Halteres black or dark..... *granulosa*
 - Halteres white or yellow 3
3. Wings yellowish, with apical infuscation; scutellum and abdomen flat; fore tarsi pale basally. (Neotropical)..... *atra*
 - Wings with discal and apical infuscation; scutellum and abdomen convex; fore tarsi black basally. (Neotropical)..... *fascipennis*
 - Wings immaculate 4
4. Mesonotum polished. (Neotropical) *laevis*
 - Mesonotum obscurely shining or granulose..... 5
5. Cheeks broad, about one-half height of eye.
 - Fore femora microscopically spinose; second costal section three times as long as third..... *melanderi*
 - Fore femora distinctly spinose; second costal section twice as long as third. (Neotropical) *similis*
 - Cheeks narrow, scarcely one-fourth eye height..... *glaphyropus*

Ochtheroidea centralis Cresson

1918. *Ochtheroidea centralis* Cresson, Trans. Am. Ent. Soc., XLIV, 60, pl. III, figs. 13, 14.

This species represents a group having the face sub-tuberculate, suggesting affinity with *Athyroglossa glabra*. It is readily distinguished by the white halteres and all tibiae being black.

Description.—♂, ♀. Black; apices of middle and hind tibiae and their tarsi, tawny. Two basal joints of fore tarsi, and halteres, white. Wings hyaline, with brown veins. Shining to polished, with mesonotum, scutellum, and abdomen, microscopically sculptured and faintly dusted with brown.

Frons broader than long; areas not differentiated. Face one-half as broad as vertex; median area tuberculate, or in profile subconically convex; sculpturing limited to a line of pits along the grooves. Clypeus projecting, mostly at a sharp angle with the face in profile. Checks one-half as broad as eye height. Antennae situated at center line of head, and below that of eyes; arista with four to five long hairs above.

Mesonotal setulae weak, rather scattered, or in close series. Scutellum strongly convex; marginal hairs and bristles long. Abdomen flattened, with lateral margins sharp; second to fourth segments broad, subequal in length, or fourth the longest; fifth short. Legs stout; fore femora with short, subequal flexor spines and a longer proximal one. Third costal section hardly one-half as long as the second. Length.—2.5 mm.

Type.—♂; Turrucare, Costa Rica, December 20, 1909, (P. P. Calvert), [A. N. S. P. No. 6136].

Material Examined.—20 specimens.

MEXICO: Tampico, Tamaulipas, December 5, (F. C. Bishopp), [U. S. N. M.].

CUBA: Cerro Cabras near Pinar del Rio, September 11, (F. E. Lutz); Guane, September 24–26, (F. E. Lutz), [A. M. N. H.]. Guantanamo, February 10, (H. Skinner).

PORTO RICO: Mayaguez, February 16, (F. E. Lutz; along stream); San Turce, near San Juan, February 12, (F. E. Lutz); [all N. Y. Ac. Sc.].

COSTA RICA: Alajuela, September 15; Bonnell Farm, Rio Surubres, October 20; Filadelfia, January 18; Turrucare, December 20; [all P. P. Calvert].

COLOMBIA: Aracataca, February, (Ujhelyi), [Hung. N. M.].

BRITISH GUIANA: Bartica, February 5, (R. J. Crew).

Ochtheroidea fascipennis Cresson (Plate XX, figure 10.)

918. *Ochtheroidea fascipennis* Cresson, Tr. Am. Ent. Soc., XLIV, 60.

This species may be placed next to *centralis*, but apparently is not closely related. It is readily distinguished by the infuscation of the wings. It is more slender than *centralis*, but the profile of the face is similar. The abdomen is elongate, not flattened, with the lateral margins turned under, not sharp, so that the venter is deeply sunken in dry specimens.

Description.—♂, ♀. Shining black; middle tarsi, hind tibiae and tarsi, yellow; halteres and fore tarsi, except bases, white; third antennal joint brown; wings with a large discal and a broad apical infuscation (fig. 10). Entirely polished, but mesonotum, scutellum, and abdomen above, obscured by close granulation, although the abdomen is less so.

Structurally similar to *centralis* with exceptions. Frons quadrate, surface somewhat relieved on the triangle. Face more spherically convex, without any median tuberculous swelling. Scutellum more triangular with apical bristles weakly tuberculate. Abdomen elongate; lateral margins revolute and the ventral lobes not appressed to venter, leaving the venter broadly sunken. Fore femora with flexor series of distinct spines which regularly diminish in length distally. Length.—2 mm.

Type.—♂; Aracataca, Department of Magdalena, Colombia, February 1912, (Ujhelyi), [Hung. Nat. Mus.].

Three topotypes, and additional specimens from Alajuela, Panama, March 12, (A. Busck), [U. S. N. M.], have been examined.

***Ochtheroidea atra* Williston (Plate XX, figures 3, 11, and 12)**

1896. *Ochtheroidea atra* Williston, Trans. Ent. Soc. London, 1896, 101, pl. XIII, figs. 146, 146a.

This is the most robust species in the genus. It may be considered typical of a group, including *similis*, in which the facial sculpturing is in the form of transverse grooves, while the pits along the parafacial groove appear as a longitudinal, subopaque line. It may readily be distinguished from *similis* by the frons and face being more deeply sculptured, not smooth; the mesonotum and scutellum opaque, the latter broad with the apical margin truncate. This is another species that suggests affinity with *Gymnopa* in many respects.

The specimens in the material studied agree in every respect with the paratypes in the American Museum of Natural History. The original description states that there were twelve males in the typical series. This may be an error, easily made in this group unless one is very careful in the determination of sex.

Description.—♂, ♀. Black; middle and hind tibiae and their tarsi, except apically, yellowish or whitish; halteres and two basal joints of fore tarsi, white; wings yellow, with a more intense cloud at apex (fig. 11). All bristles and hairs small and minute.

Eyes noticeably obliquely oval. Frons nearly as broad as long, shining and sculptured with rugae and pits on the triangle; bristles weak, the frontal and orbital not discernible. Face, in profile, moderately sub-conically gibbose

below medianly (fig. 3); facialia with transverse pits and rugae along the groove which extend mesally toward the transversely wrinkled median gibbosity, the wrinkling extending up to and on the weak carina; bristles short, hair-like. Cheeks one-half as broad as eye-height. Antennae short, situated at the center line of the eyes and above that of the head; arista with about three hairs above.

Mesonotum convex, opaque, densely granulose and somewhat pollinose. Scutellum sculpture as on mesonotum, flat, rectangularly broader than long, with all the marginal hairs and bristles on minute tubercles. Abdomen flat, elongate-ovate, subopaque, with sharp lateral margins, with sculpturing as on mesonotum but less pronounced; fourth segment the longest; fifth the shortest. Legs slender; femoral spines with the proximal one abruptly the longest, and the remaining ones more uniform (fig. 12). Third costal section of wings three times as long as second. Length.—2.5 to 2.75 mm.

Type.—Male ?; St. Vincent, West Indies, [British Museum?].

Paratypes.—A male in the American Museum of Natural History collection, No. 20324, bears no data except Dr. Williston's determination label; a female in the same collection is also labelled "Leeward near sea by open stream, Sept., no. 20322." There is also a specimen in the Kansas University collection.

Material Examined.—16 specimens.

PANAMA: Colon, December, 1911, (Ujhelyi), [Hung. Nat. Mus.].

TRINIDAD: June, 21, (A. Busek), [U. S. N. M.].

BRITISH GUIANA: Bartica, May 11, (R. J. Crew). Georgetown, July 11, [A. N. M. H.]. Tumatumari, July 11, [A. M. N. H.].

***Ochtheroidea similis* Cresson (Plate XX, figure 7.)**

1918. *Ochtheroidea similis* Cresson, Trans. Am. Ent. Soc., XLIV, 61.

A very distinct species showing affinity with *atra*, but with some aspects of *laevis*. The face is very strongly convex, rather abruptly so, giving a gibbose appearance; facialia distinctly, transversely wrinkled, with the hair-like bristles arising from grooves instead of pits, as in *laevis*. These as well as the broad face and cheeks are the salient characters.

Description.—♂. Black; middle and hind tibiae and their tarsi, except apices of latter, yellow; fore tarsi with three basal joints whitish; halteres white; wings hyaline, with dark veins. Shining to nearly polished.

Frons broader than long. Face broad, more than one-half as broad as vertex, deeply depressed above and evenly convex below medianly; facialia with deep, transverse pits; bristles hair-like; median area micro-granulose, hardly polished. Cheeks about one-half as broad as eye-height. Clypeus retreating. Arista with seven hairs.

Mesonotum and scutellum not quite polished, micro-granulose; setulae of former minute, scarcely discernible, not striated. Abdomen polished;

fourth segment nearly twice as long as third. Legs rather stout; fore tibiae noticeably flattened; anterior extensor surface of middle and hind tibiae silvery; femoral spines strong and numerous; the proximal one separated, very stout and more obliquely inclined than the others (fig. 7). Second costal section of wings twice as long as third. Length.—2.5 mm.

Type.—♂; Cachi, Costa Rica, March 7, 1910, (P. P. Calvert; beaches on back channel of Rio Reventazon), [A. N. S. P., No. 6134].

Paratype.—1 ♂; topotypical.

Ochtheroidea melanderi new species (Plate XX, figures 6, 9.)

This species, although suggesting *similis* in many respects, is evidently very distinct, and will be readily recognized by the characters given below.

Resembling *similis*, but less shining. Facial pits shallow and not transverse (fig. 9). Apical bristles of scutellum hardly longer than the setulae or marginal hairs. Fore femora with only minute flexor spines (fig. 6) in the male, which are hardly discernible in the female. Second vein long, so that the second costal section is at least three times as long as third.

Type.—♂; Stanford University, California, July 15, (A. L. Melander), [University of Washington Collection].

Paratypes.—4 ♂, 3 ♀; topotypical.

Ochtheroidea laevis Cresson

1918. *Ochtheroidea laevis* Cresson, Trans. Am. Ent. Soc., XLIV, 61.

This species is readily distinguished by its highly polished surfaces. The face is more strongly convex than in *glaphyropus*, and the sparse mesonotal setulae are arranged in well separated rows.

Description.—Polished black; middle and hind tibiae and their tarsi, except apices, yellow; three basal joints of fore tarsi and halteres, white; wings hyaline with dark veins. Middle tibiae sometimes infuscated medially.

Similar to *glaphyropus*, but larger. Frons somewhat broader than long, with bristles well developed. Face narrowed above middle to one half as wide as vertex. Cheeks narrow, about one-fifth as broad as eye-height. Arista with six to seven hairs.

Mesonotal setulae sparse and distinctly seriated. Apical bristles of scutellum with minute tubercles at bases. Third and fourth abdominal segments subequal. Legs as in *similis*; femoral spines few, about five, the proximal one much the largest, stout, and distally removed. Length.—2.5 to 3 mm.

Type.—♂ ?; Alajuela, Costa Rica, September 15, 1909, (P. P. Calvert; sweeping), [A. N. S. P., No. 6135].

Material Examined.—27 specimens.

COSTA RICA: Alajuela, September 15, (P. P. Calvert).

CUBA: Guantunano, February 10, (H. Skinner).

PORTO RICO: Adjuntas, June 10, (F. E. Lutz and A. J. Mutchler; at light); Arecibo, March 1-4, (F. E. Lutz); Barros, June 4, (F. E. Lutz and A. J. Mutchler; in open field); Mayaguez, February 16, (F. E. Lutz; along stream); Foothills of Mt. Duque, Naguabo, March 9, (F. E. Lutz); Side of El Yunque near Rio Grande, July 3, (F. E. Lutz; forest); [all N. Y. Ac. Sc.].

The material from Cuba and Porto Rico shows considerable white or yellow on the apices of the fore tibiae, but otherwise there seems to be no difference.

Ochtheroidea glaphyropus Loew (Plate XX, figure 8)

1878. *Athyroglossa glaphyropus* Loew, Zeits. f. Ges. Naturwiss., Berlin, LI, 197.

In this species the face is evenly convex, hardly visible, in profile, beyond the orbits, and making a continuous line with the generally compressed clypeus. The surface of the mesonotum and scutellum is minutely granulose, giving them a dull, greasy appearance, but they are not pruinose; the setulae are numerous and minute. The specimens from Central and South America seem to be identical with those from the north.

Description.—Black; halteres and fore tarsi white, with apical joints of latter sometimes darker; middle and hind tibiae, and tarsi, except apical joints, tawny. Wings hyaline with dark veins. Polished except the mesonotum and scutellum, which are somewhat obscured by the minutely granulated surfaces. Anterior surface of middle tibiae silvery.

Eyes vertically elongate. Frons quadrate or orbits converging; proclinate orbitals minute. Face narrowed to about one-third width of vertex, depressed above, with lower median area, in profile, evenly and gently convex and retreating (fig. 8); bristles hair-like, arising from minute pits along the groove. Cheeks narrow, at most one-fourth as broad as eye-height. Antennae situated above center line of eyes and of the head; third joint oval; arista with six to seven hairs above.

Mesonotal setulae numerous, in very close series. Scutellum convex or flattened, triangular; bristles not tuberculate at bases. Abdomen broad, ovate; segment three and four subequal; lateral margins revolute. Femoral spines weak, subequal. Second costal section three to four times as long as third. Length.—2 to 2.5 mm.

Type.—♂ ?; Texas, [M. C. Z., No. 11145.]. This specimen has been examined and is in good condition. It bears a "Texas" and another small square orange label, and was selected as the type. Another specimen from the same locality was treated as a paratype, but has the apices of the fore tarsi white.

Material Examined. 61 specimens.

NEW YORK: Cold Spring Harbor, Long Island, August, [Wash.].

PENNSYLVANIA: Landsdale, July 12; Swarthmore, July 1-31; (all Cresson).

DISTRICT OF COLUMBIA: Washington, August 13, [Wash.].

MARYLAND: Bladensburg, September, 23, (R. C. Shannon); Plummer's Island, July 24, (Shannon; at light); [all U. S. N. M.].

VIRGINIA: Rosslyn, July 6, (F. Knab), [U. S. N. M.].

GEORGIA: Billy's Island, Okefenokee Swamp, June 15 to July; Spring Creek, Decatur County, June 7, (J. C. Bradley); [all Cornell].

SOUTH CAROLINA: Summerville, August 22, (J. C. Bradley), [Cornell].

ALABAMA: (C. F. Baker no. 2245), [Aldrich].

LOUISIANA: Opelousas, May, [Wash.]. Tallulah, August 10, (H. Perkins), [U. S. N. M.].

TEXAS: Devil's River, May 5, (F. C. Bishopp), [U. S. N. M.].

COSTA RICA: Bonnell Farm, Rio Surubres, October 20; Turrucares, December 19; (all P. P. Calvert).

BOLIVIA: Piedra Blanca, April, [Wash.].

Ochtheroidea granulosa new species

This is the only known American species having black halteres, so there will be no difficulty in distinguishing specimens belonging here. In general it resembles *glaphyropus*, and probably will be found in some collections under that name. There seem to be no apparent differentiations in the South American and West Indian specimens.

Description.—Similar to *glaphyropus*, but the face medianly, from antennae to epistoma, minutely granulose; the pits along the groove are transverse. Mesonotum and scutellum distinctly granulose. Halteres black. Arista with five to six long hairs. Femoral spines scarcely discernible.

Type.—♂; Swarthmore, Pennsylvania, July 31, 1910, (Cresson; along shady creek), [A. N. S. P., No. 6345].

Material Examined. 18 specimens.

MASSACHUSETTS: New Bedford, [Wash.].

NEW YORK: Norton's Landing on Cayuga Lake, June 5, (H. H. Smith), [Cornell].

PENNSYLVANIA: Swarthmore, July 31 to October 19, (Cresson). Point Pleasant, May 30, (H. S. Harbeck).

DISTRICT OF COLUMBIA: Washington, August 17, [Wash.].

MARYLAND: Bladensburg, September 28, (R. C. Shannon); Cabin John Bridge, April 28, (Knab & Malloch); Plummer's Island, April 8 to July 11, (R. C. Shannon); near Plummer's Island, May 14 to August 5, (R. C. Shannon); [all U. S. N. M.].

VIRGINIA: Dead Run, Fairfax County, April 7 to September 27, (R. C. Shannon), [U. S. N. M.].

INDIANA: Lafayette, July 4, [Wash.].

GRENADA: [Aldrich].

CEROMETOPON Cresson

1914. *Cerometopon* Cresson, Ent. News, xxv, 241.

A genus of but one known species, which suggests those of *Gymnopa* in general appearance. The face is, apparently, without the usual differentiated areas, a character which may be present only in the type species. The parafacial groove is suggested by a line of deeper pits in the excavated wrinkles. Otherwise the entire face is transversely wrinkled.

Generic Diagnosis.—Head slightly broader than high. Eyes obliquely elongate, not prominent. Vertex sharp; ocellar bristles opposite the anterior ocellus; frontal and orbitals well developed; lunule not developed. Face with subhemispherical concavity beneath antennae, below which the face is evenly convex, not prominent, and strongly, transversely wrinkled; bristles numerous, situated in deeper pits within the wrinkles in a series each side corresponding with the parafacial groove. Cheeks ample, with the post-buccal margin strongly keeled. Clypeus prominent. Mouth small. Antennae short, with second joint weakly spined; arista pectinate above.

Thorax quadrate; no prescutellars; setulae numerous and irregular. Scutellum ample. Abdomen ovate, with fourth segment the longest; third and fifth subequal. Legs simple; fore coxae short; fore femora unarmed. Wings with second vein long; third and fourth converging; alula auriculate, not ciliate.

Genotype.—*Cerometopon mosilloides* Cresson, (1914).

Cerometopon mosilloides Cresson

1914. *Cerometopon mosilloides* Cresson, Ent. News, xxv, 242, pl. x, fig. 3.

Description.—Black; palpi, tarsi except apices, apices of middle and hind femora and their tibiae, yellow; all tibiae silvery on outer surfaces; fore tibiae brown; wings yellowish with pale veins.

Frons broader than long, shining, with no differentiated areas, but with distinct spherical pits as follows, a pair behind and a pair before the line of the anterior ocellus. Face more than one-half as broad as vertex, shining, or slightly dusted in the depressions, with metallic tints. Cheeks hardly one-half as broad as eye-height. Clypeus depressed. Antennae with third joint discoidal; arista with five hairs.

Mesonotum opaque with greenish gray, granular, pollinose vesture, and three narrow brown vittae medianly, which do not attain the posterior margin. Scutellum almost flat, colored as mesonotum, with weakly tuberculated

apical bristles. Pleura except mesopleura polished. Abdomen polished, with slight greenish tinge; lateral margins revolute. Femora polished; fore pair finely ciliate beneath. Length.—3 to 3.5 mm.

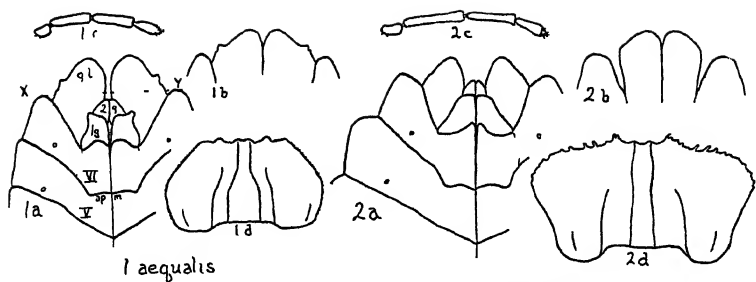
Type.—♂; Baranguilla, Department of Atlantico, Colombia, March, 1912, (Ujhelyi), [Hungarian National Museum Collection].

Eight additional specimens have been examined, all from Paraguay: San Bernardino, February to March, (Barbarczy), and Puerto Max, January to April, (Vezenui), [all Hung. Nat. Mus.]

The specimens from Paraguay are, apparently, not in anyway different from the type. It is difficult to determine the sexes in this species. The type, however, seems to be a male.

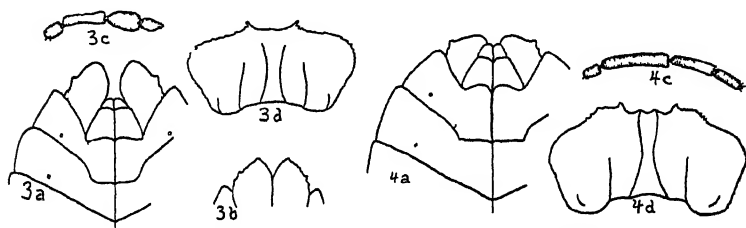
EXPLANATION OF PLATE XX

- Fig. 1.—*Gymnopa tibialis* Cresson. Profile of head. (× 45)
- Fig. 2.—*Athyroglossa glabra* (Meigen). Profile of head. (× 45)
- Fig. 3.—*Ochtheroidea atra* Williston. Profile of head. (× 50)
- Fig. 4.—*Gymnopa tibialis* Cresson. Wing. (× 25)
- Fig. 5.—*Gymnopa tibialis* Cresson. Fore femur. (× 45)
- Fig. 6.—*Ochtheroidea melanderi* new species. Fore femur. (× 45)
- Fig. 7.—*Ochtheroidea similis* Cresson. Fore femur. (× 45)
- Fig. 8.—*Ochtheroidea glaphyropus* (Loew). Profile of head. (× 45)
- Fig. 9.—*Ochtheroidea melanderi* new species. Profile of head. (× 45)
- Fig. 10.—*Ochtheroidea fascipennis* Cresson. Wing. (× 30)
- Fig. 11.—*Ochtheroidea atra* Williston. Wing. (× 30)
- Fig. 12.—*Ochtheroidea atra* Williston. Fore femur. (× 45)



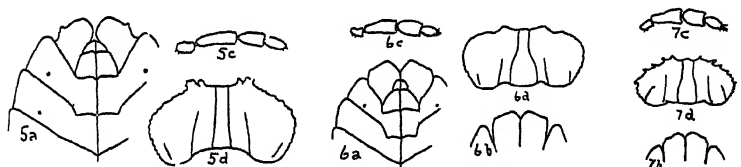
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2 crenatus



3 quadrilineatus

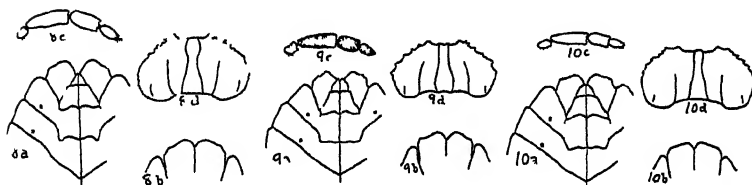
4 amplatus



5 montinus

6 ornatus

7 coarctatus

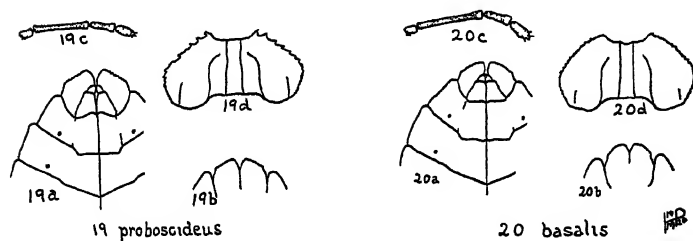
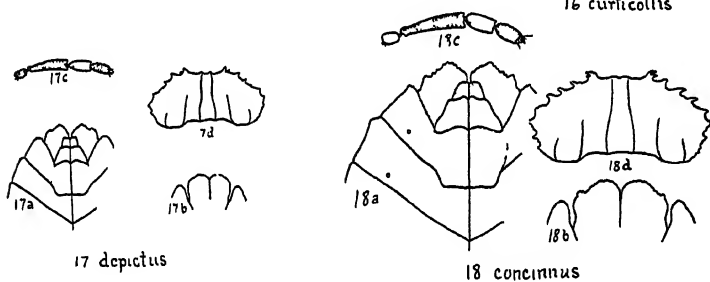
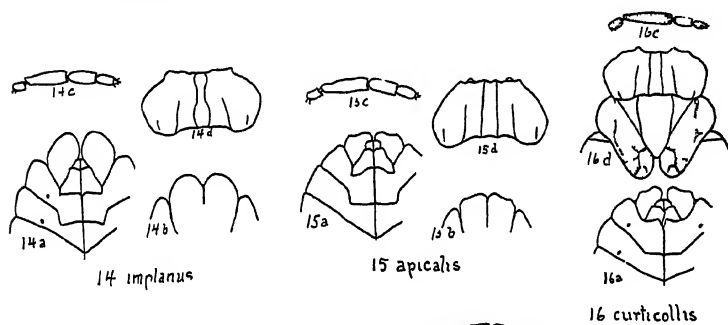
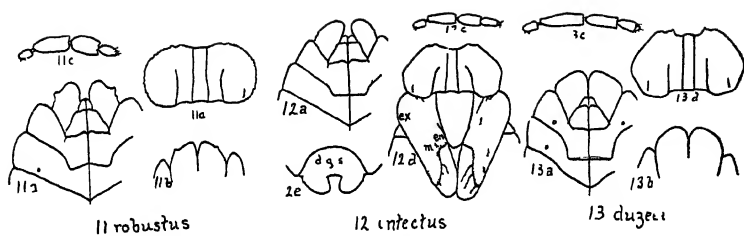


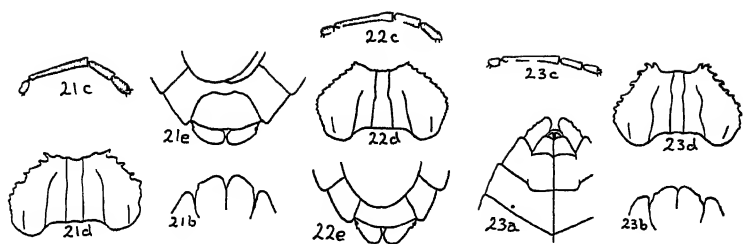
8 fuscomaculatus

9 pannosus

10 behrensi

10b

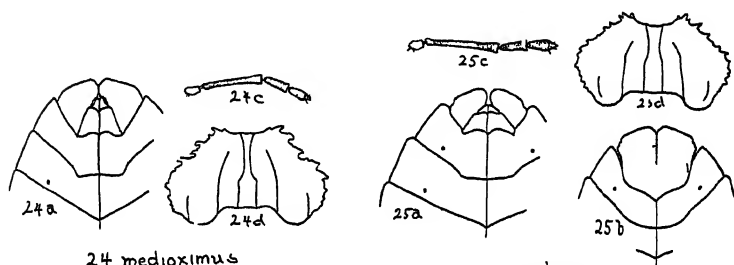




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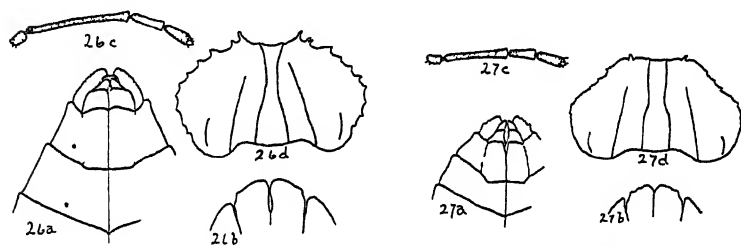
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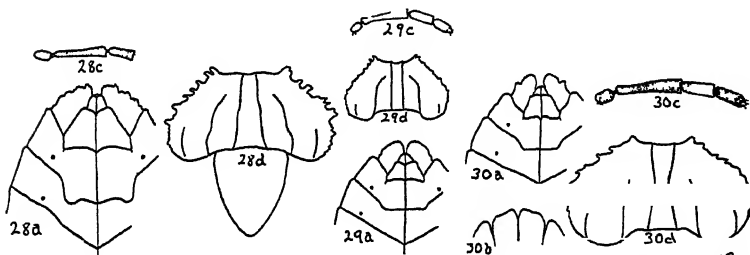
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25 vadosus



26 debilis

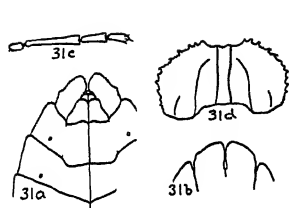
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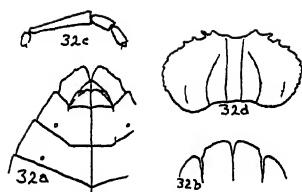
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29 opertaneus

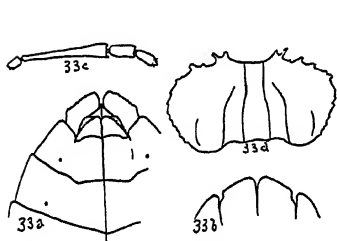
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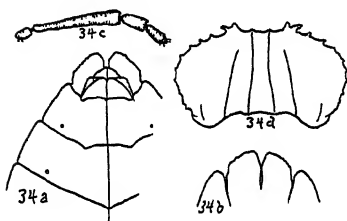
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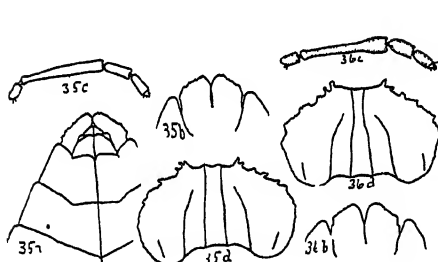
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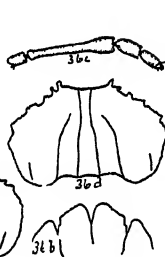
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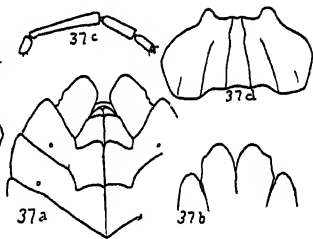
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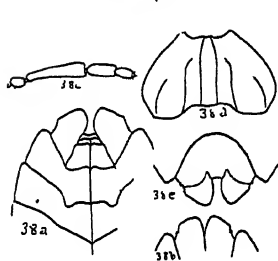
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36 approximatus



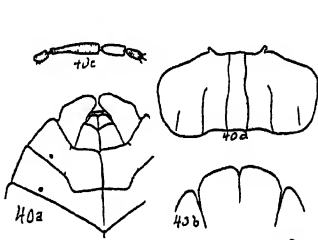
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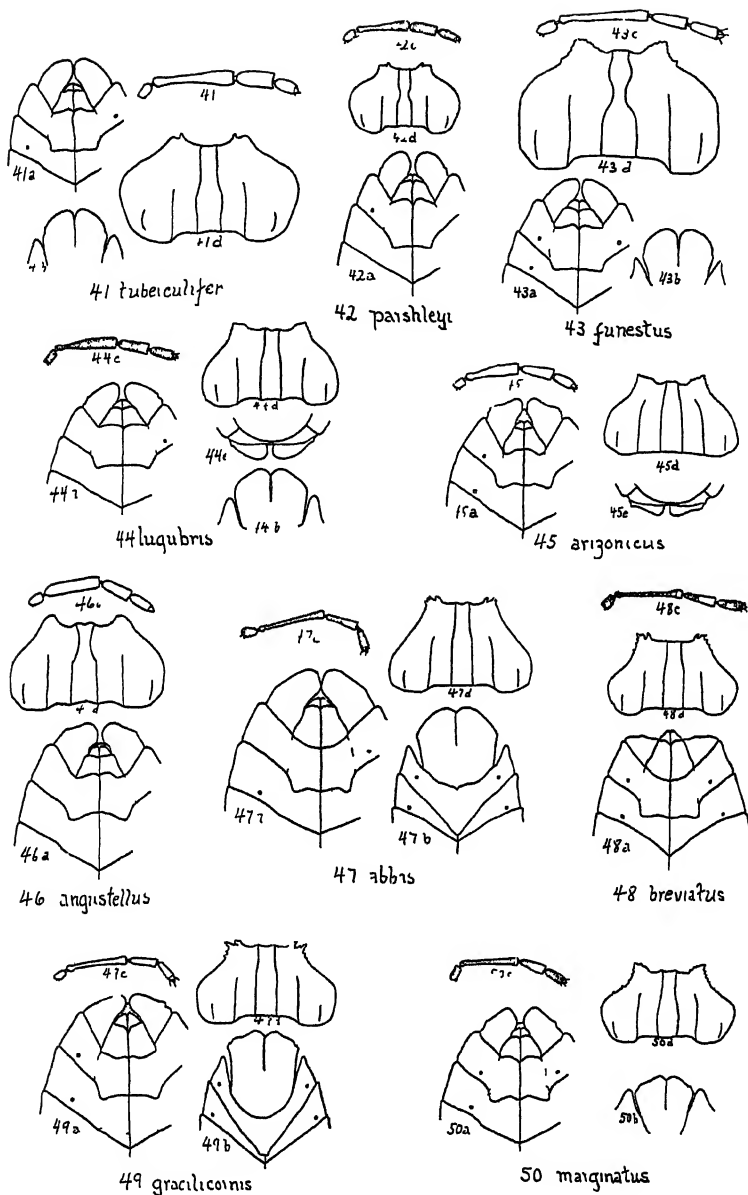
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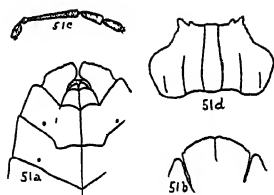


39 insignitus

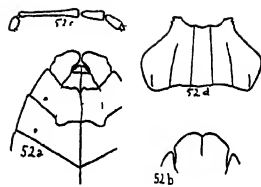


40 uniformis

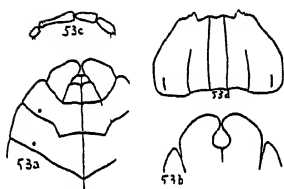




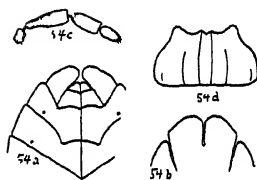
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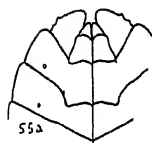
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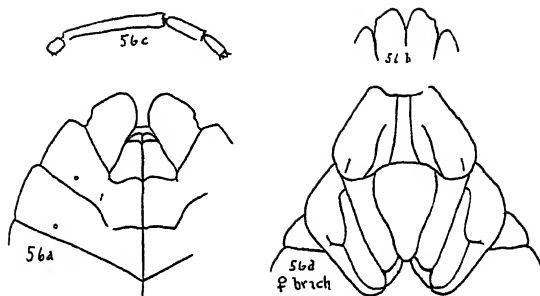
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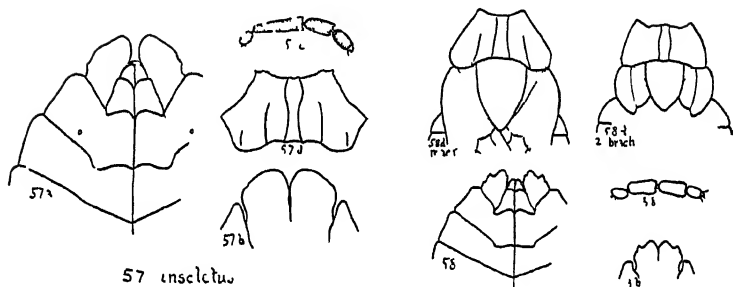
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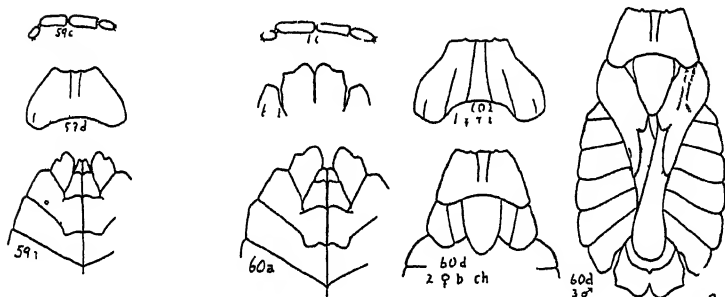


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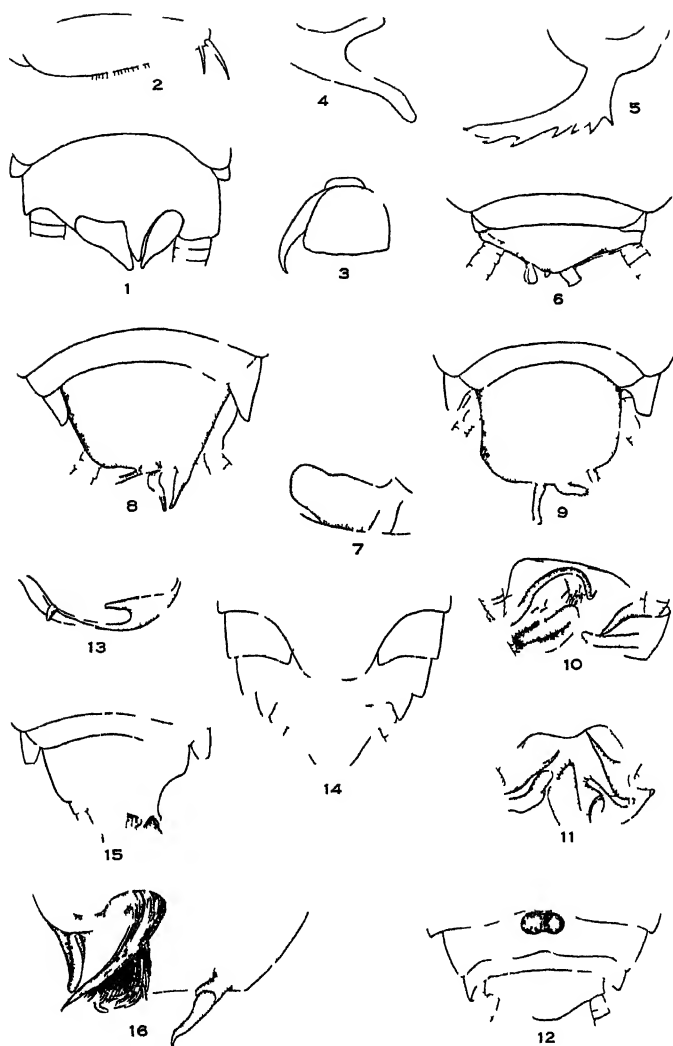
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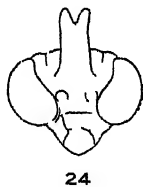
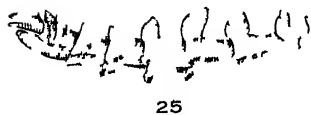
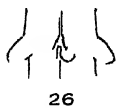
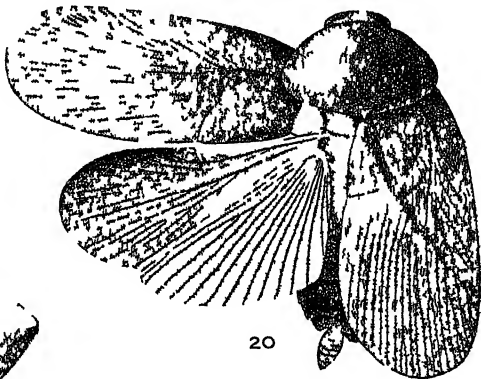
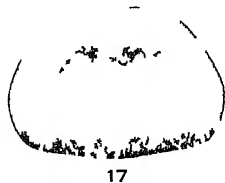
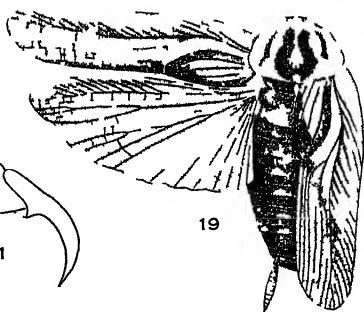
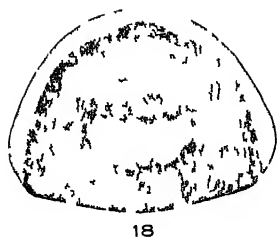
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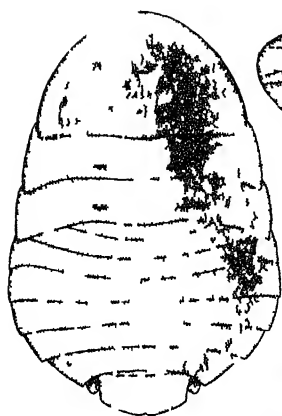


59 nigrinus

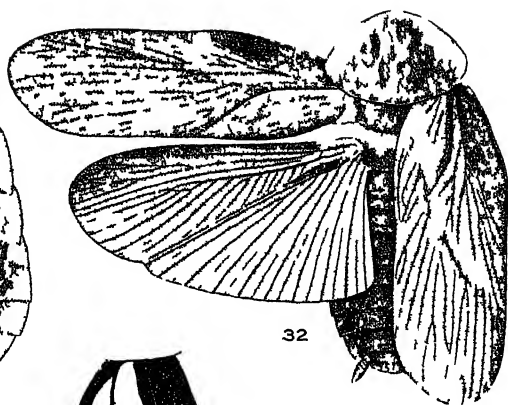
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31



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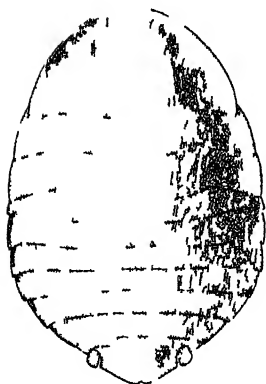
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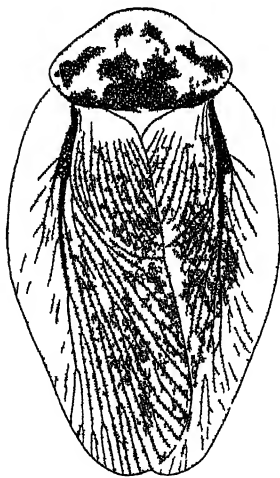
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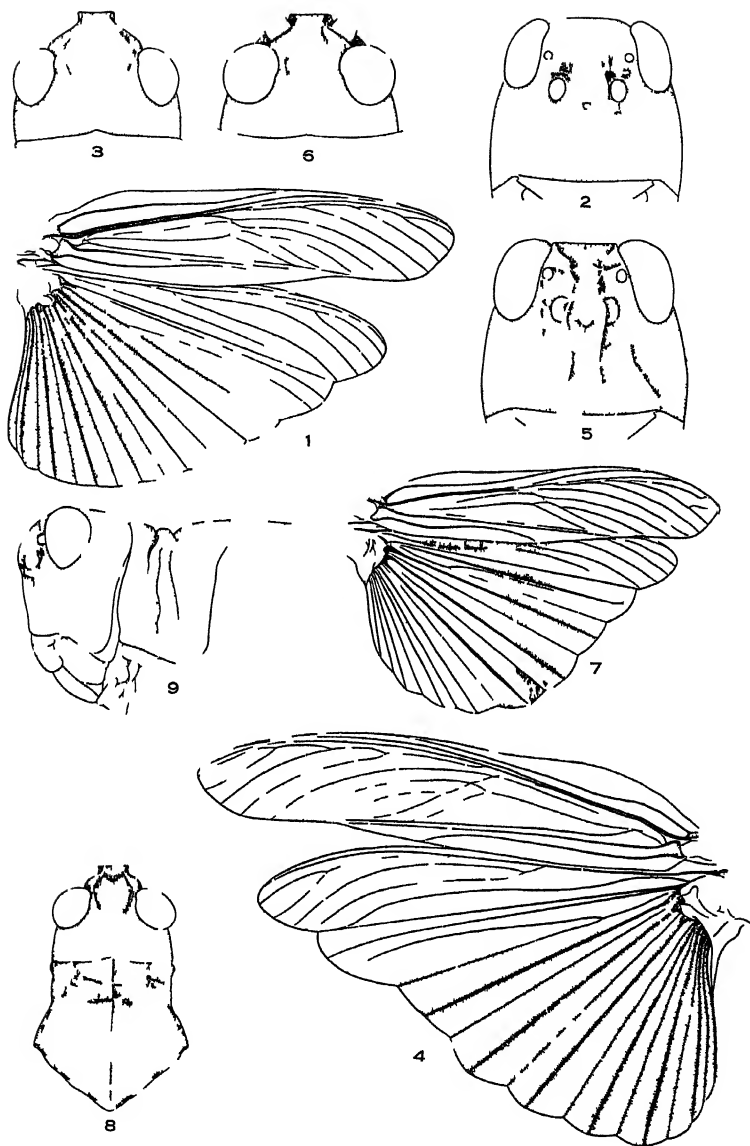
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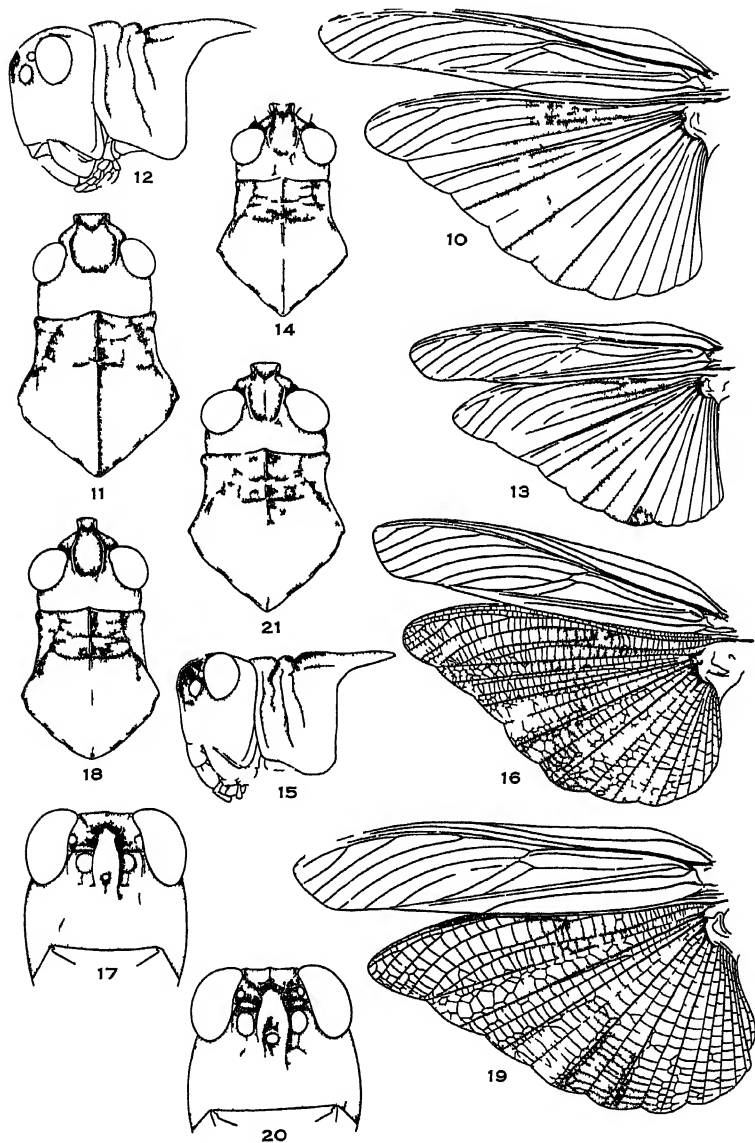


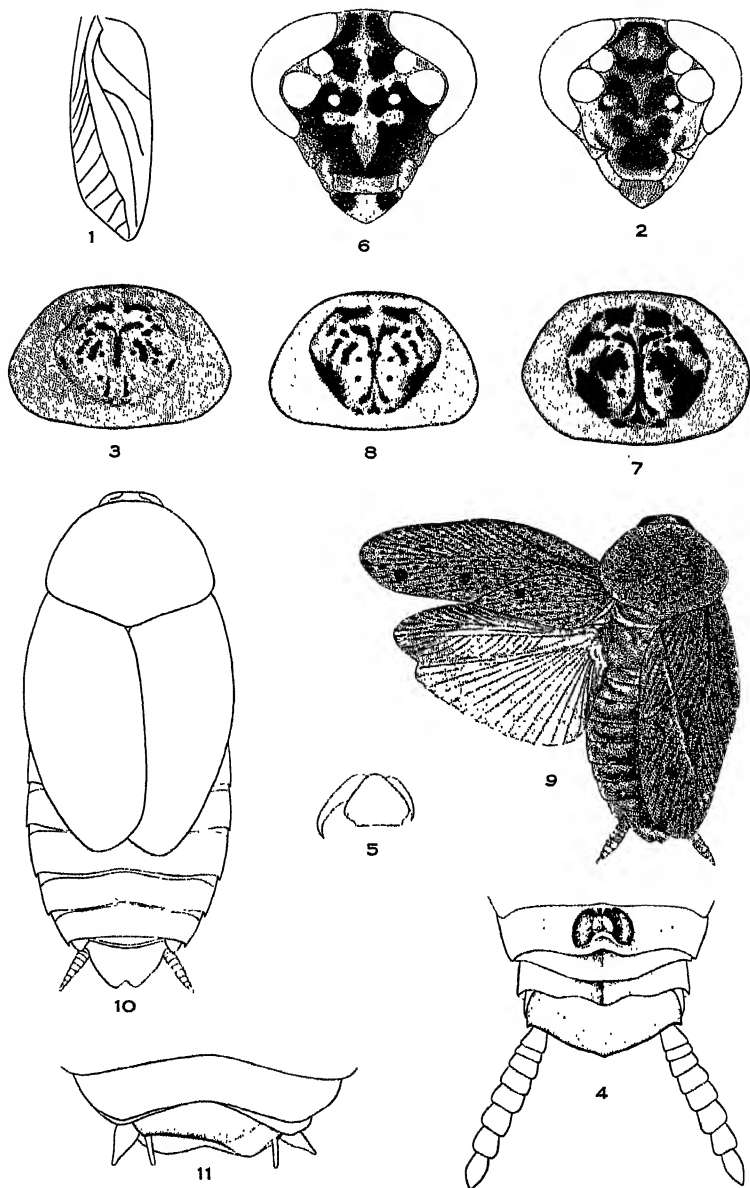
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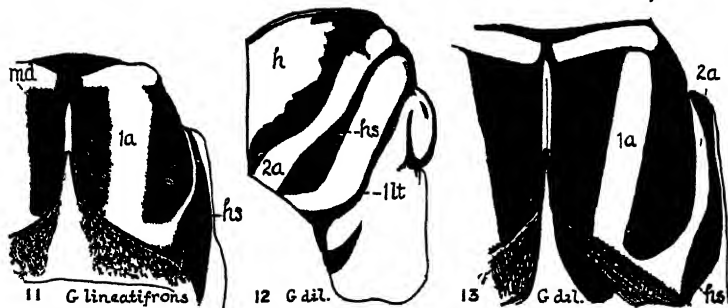
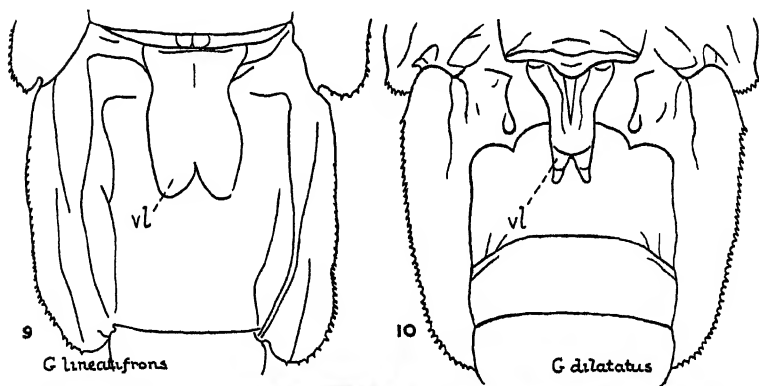
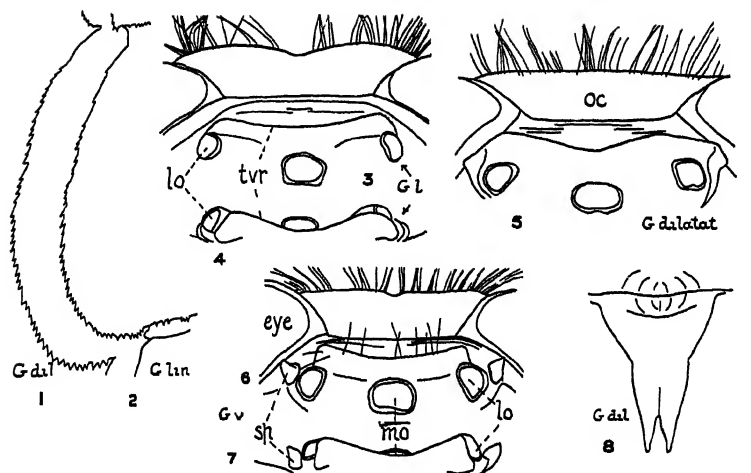


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CALVERT—SPECIES OF GOMPHUS (ODONATA)

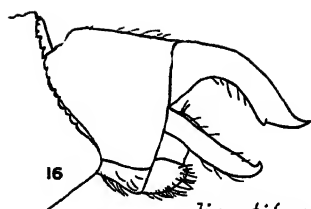


14

dilatatus

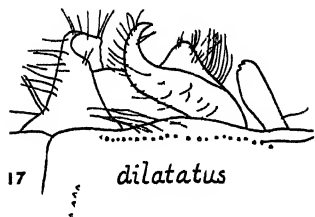


15



16

lineatifrons



17

dilatatus



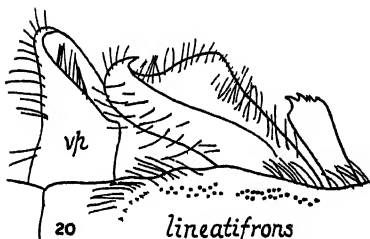
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lineatifrons



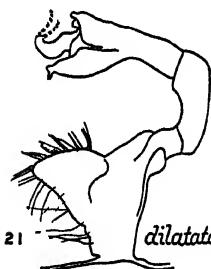
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vastus



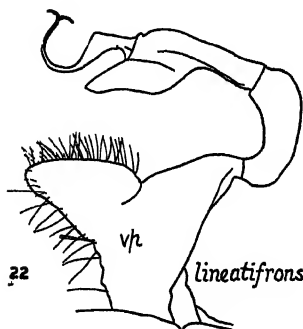
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lineatifrons



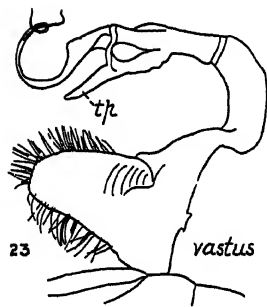
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dilatatus



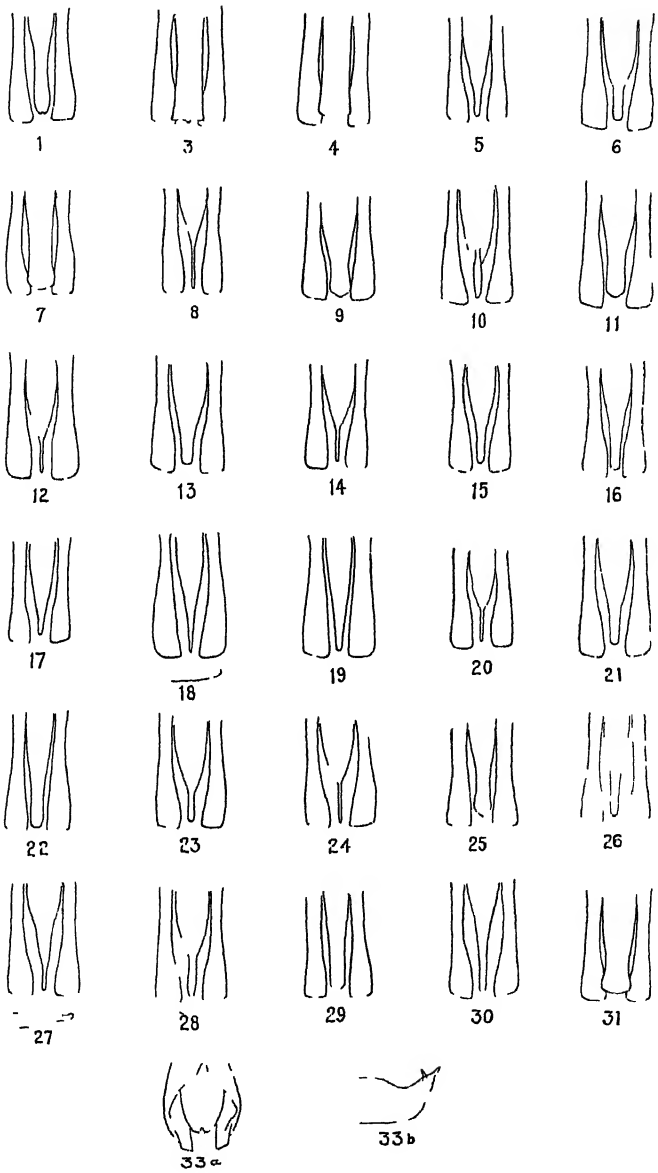
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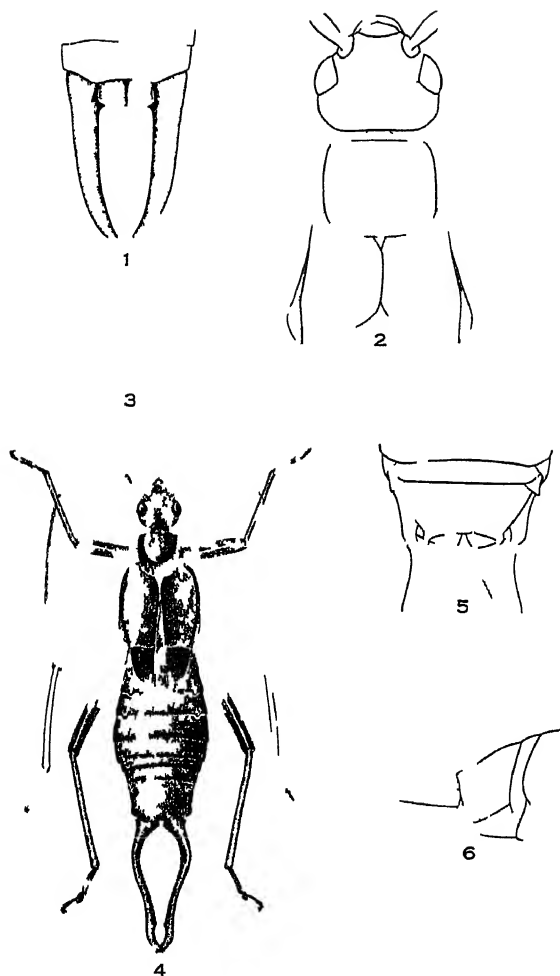
lineatifrons



23

vastus





REHN—COSTA RICAN DERMAPTERA

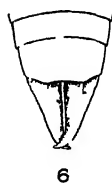
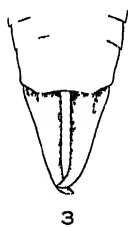
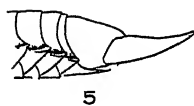
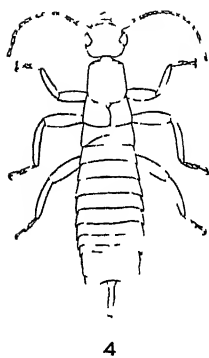
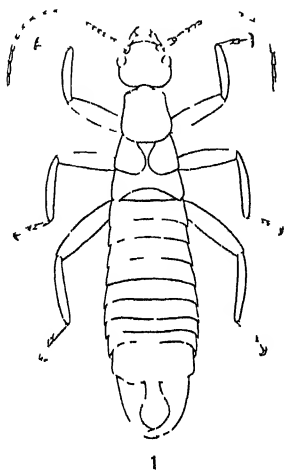


FIGURE 1.

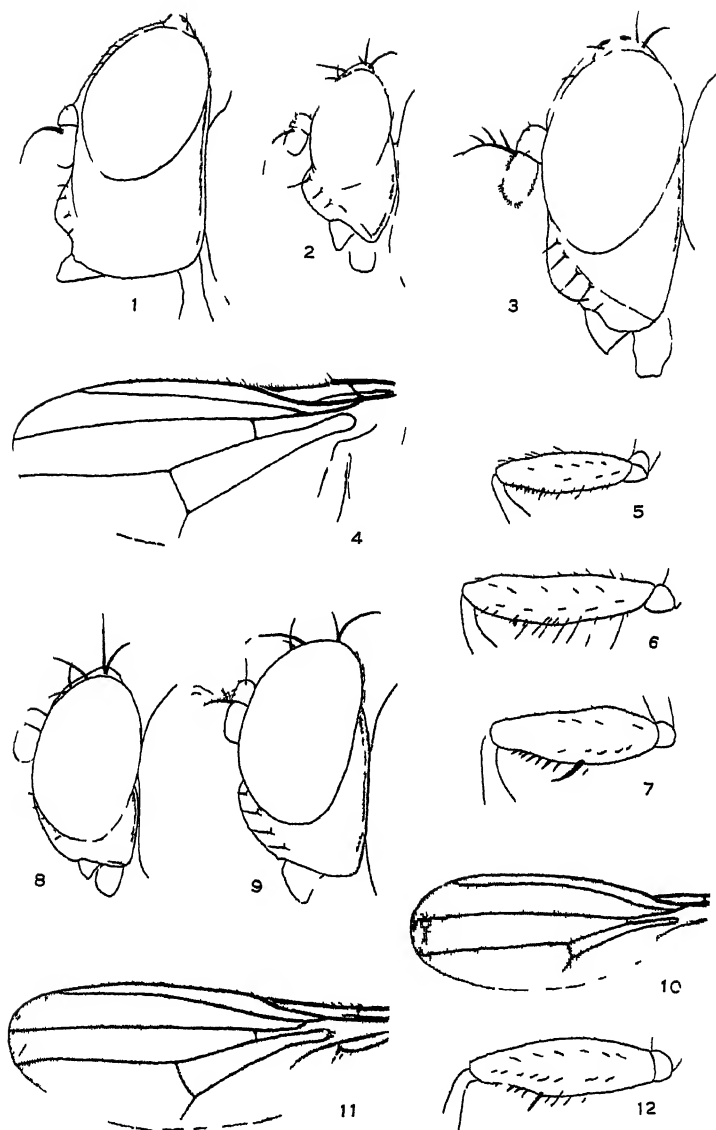


FIGURE 2.

HEBARD—GENUS EUBORELLIA



HEBARD—GENUS EUBORELLIA



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